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Martin Dewey, D.D.S., M.D., New York
Editor-in-Chief

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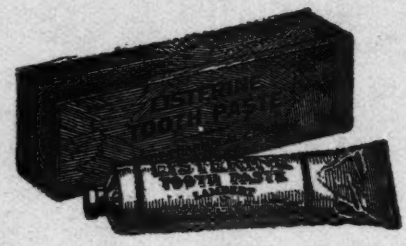

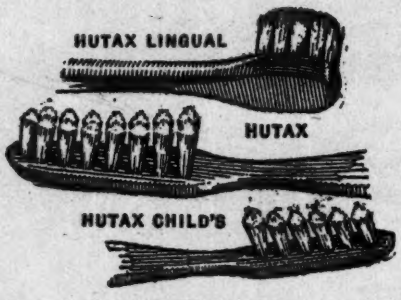

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The International Journal of
Orthodontia and Oral Surgery

VOL. VII ST. LOUIS, APRIL, 1921 NO. 4

ORIGINAL ARTICLES

THE PRINCIPLES OF THE JACKSON REMOVABLE APPLIANCE*

BY VICTOR HUGO JACKSON, M.A., M.D., D.D.S., NEW YORK CITY

IN PRESENTING this paper, it is the purpose of the author to describe the more improved methods of practice in his treatment of "Orthodontia and Orthopedia of the face", considering as far as time will permit, the general principles and advantages of the removable regulating appliances devised by him.

The first object in developing a new method of anchorage to the teeth was to perfect one which would permit the appliance to be movable and, at the same time, be securely retained.

A movable appliance is one that can be readily removed by the patient and by the operator for cleansing the teeth and the apparatus.

We are all familiar with fixed regulating appliances. They are anchored to the teeth in such a manner that they cannot readily be removed by the patient for cleansing or by the operator for adjustment.

Recently, the whole profession and many patients have begun to realize the great necessity of the careful cleansing of the teeth being carried out systematically by the treatment known as "Prophylaxis" and are becoming aware that, for that reason, regulating appliances and bridges of artificial teeth should be movable.

Realizing this necessity, the writer has spent most of his professional life in devising and developing such appliances as would help to prevent decay and save the teeth.

A few operators have been opposed to movable appliances. The opposition was due principally to the careless habit of an occasional patient in leaving his regulating appliances out at times, which naturally would interfere with the progress of the regulating. However, by the use of a *record card* that the

*Read before the meeting of the American Society of Orthodontists, Chicago, April 5, 1920.

operator has at command, this practice would be readily detected and the condition corrected.

When the operator has discovered that a movable apparatus is not kept in place by the patient at all times, including time of mastication, as directed, he should immediately ligate the appliance to the anchorage teeth with wire, making it a *fixed appliance*, which generally can be done in a few minutes, and then direct the patient to return in four days for further adjustment of the appliance and for cleansing. At the same time, he should notify the parents that the ligating is necessary, as the conditions require that the force of the appliance should be continuous. In wearing the appliance ligated, the patient soon learns that it is not so pleasant to use a fixed appliance and make extra visits, as to wear a movable one, keep the teeth and appliance in a cleansed condition and make fewer visits. When necessary and well managed, this plan works well.

When rubber "equalizing bands" are used with a *fixed* appliance, the child is quite as apt to deceive the operator by leaving off the equalizing bands, which might prove as harmful as the leaving out of a movable appliance.

The movable regulating appliances to be described are made of spring-wire. They are so anchored to the teeth that they can be easily removed by the patient for the cleansing of the teeth and appliance.

For this purpose, the patient is directed to remove the appliance after each meal and before retiring. It can be quickly removed by the operator for making any necessary changes in its adjustment. The movable appliance is made on a model of the teeth in the laboratory.

When the model is accurate, the appliance should fit the natural teeth of the arch so well that there would not be any dressing or change required in its adjustment.

APPLIANCES TO DESIGN

Before designing a regulating apparatus, accurate models of the maxillary and mandibular arches of the teeth are made and thoroughly examined to determine how parts of an appliance can best be arranged to correct the irregularity.

All regulating appliances are designed from the study and measurement of the models and obtainable data regarding the regulating case. Pencil designs of the apparatus are made in a "*duplicating*" or a "*triplicating*" book; one copy of the design remains in the book permanently; another, with the models, aids the laboratory assistant in understanding the form of appliance to be made; and the third copy is utilized in cases of consultation, being forwarded to the consultant to assist in describing the plan of procedure and treatment.

METALS FOR APPLIANCES

Precious metals for making appliances have always been recommended by the author, but it requires much more time in making and repairing them, than when suitable base metals are used. He soon learned that some base metals have more spring properties and are found to be more efficient, as they

are more resilient and persistent than others. The use of *silver nickel*, or *German silver*, springs has generally been found satisfactory. Its appearance is desirable as it is near the color of platinum which is much less conspicuous than gold. This would prompt its continued use. Polished gold can be seen at a considerable distance from the patient, which, with some would be objectionable.

Another important reason for recommending base metals is that springs can be more quickly united with chemically pure tin as a solder than with gold, and can be unsoldered for changing the relationship of the pieces in a few minutes without drawing their temper or otherwise injuring them. This does not follow when gold solders are used.

PHOSPHOBRONZE

Phosphobronze of good quality is a satisfactory spring metal. It is similar to gold in color but is useful for making springs and spurs for orthodontic appliances. In use it holds its color well and is more springy than the metals described. When well drawn, it is tough and suited for much longer service than any of the metals mentioned. This is owing to its resilience and persistence. In time, all metals lose their springiness and come to what is known as a "stand". The metals above mentioned, usually come to a stand much sooner than the phosphobronze. It is claimed that now there is no lead in its composition. Chemically pure tin, as a solder, has more affinity for phosphobronze than for most other metals, thereby making a stronger union. In use there is no special chemical action apparent or waste around the springs.

GOLD PARTIAL CLASP METAL

After much experimentation the writer succeeded in forming a partial clasp metal made of 18 karat gold rolled plate, ¼ on German silver, 36 U. S. standard wire gauge. In making an appliance, the gold side rests against the tooth, while the solder, chemically pure tin, is applied on the German silver side, because it has more affinity for the German silver than for the gold. The 18 k. gold as purchased in the market was at one time recommended by the writer for partial clasps but it was found that, after being in use for a time, it would peel from the solder.

LIGHT COLORED BRONZE

Partial clasps made of *light colored* bronze spring plate, No. 36 gauge, have been used in certain cases for several years with thorough satisfaction. When used for partial clasps and other parts of an appliance, as resting on the gum, etc., the metal keeps bright like gold and does not encourage fermentation, or stain the teeth. In practice, however, the writer is continuing to use the gold partial clasp metal.

APPLIANCES TO MAKE

The author will describe as in previous writings, his general plan of making regulating appliances, first speaking of the principal parts of an appliance and their purposes and also his method of uniting them with solder.

The general parts of an appliance are *partial clasps, spring clasps* or *wire clasps, base wire, spurs* and *springs.* These are usually united with chemically pure tin as a solder.

In making a regulating appliance, an accurate model is necessary. Any molar or premolar teeth that are not fully erupted but are to assist in the anchorage should first have a groove cut in the plaster of the model beside the tooth toward the neck for the adjustment of a partial clasp to project under the gum to strengthen the anchorage. This is usually done with a rather straight

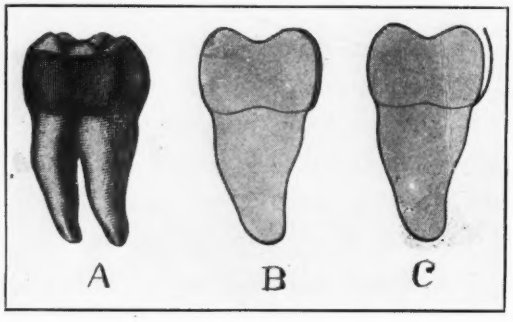

Fig. 1.

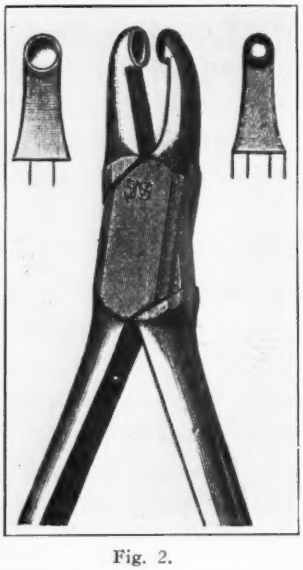

Fig. 2.

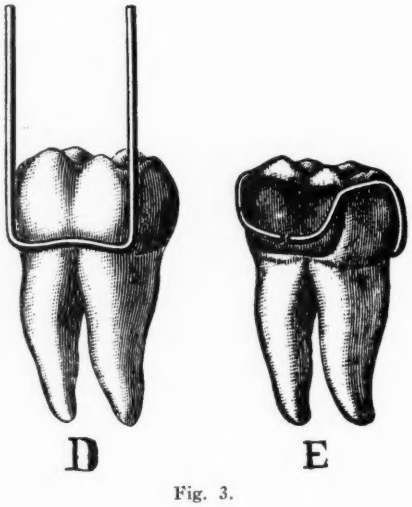

Fig. 3.

hoe excavator. The operator must be sure to preserve the natural shape of the tooth and not remove or injure the plaster representing the gum on the lingual side of the groove as, in soldering, the solder is liable to run into this injured part, which would cause the appliance when inserted to rest on the gum, while the thin partial clasp would pass between the tooth and gum without causing irritation.

PARTIAL CLASP FOR ANCHORAGE—FIG. 1—*A*

A partial clasp is made of plate metal No. 36 U. S. standard wire gauge, being of sufficient size to fit the lingual surface of a tooth used for anchorage. It is contoured with a *contouring plier* having the end of one beak cup shaped

and the other formed to fit it. (Fig. 2.) The partial clasp is always overcontoured to cause it to rest on the tooth at the neck and near the grinding surface. (Fig. 1—*A, B, C.*) A partial clasp is arranged to fit the lingual side of each anchorage tooth, as to two canines or premolars and two molars in each arch. When connected by a base-wire in this manner, the anchorage is quite complete, but with the improved anchorage, it is generally found advisable to have also partial clasps arranged on all of the teeth in the lateral maxillary divisions of the arch, that is—the molars, premolars and canines.

CLASPS FOR ANCHORAGE

There have been various forms of clasps devised by the author for anchoring regulating appliances, many of which have previously been described. Following are some of the ordinary examples:

Fig. 4.

SPRING CLASP—FIG. 3—*D, E.*

A spring clasp is usually made of spring wire No. 20, 21 or 19 U. S. standard wire gauge shaped with a *clasp-bender* (Fig. 4) or a round-nosed pliers to fit the buccal surface of an anchorage tooth near the gum with both ends formed to pass over the arch at the junction of the two adjoining teeth to rest on a *partial clasp* and be attached with solder. It is then known as a *spring clasp* attachment. (Fig. 3-*E.*)

WIRE CLASP FOR ANCHORAGE

A round wire clasp is used in any part of the arch. For clasping a molar it is generally arranged to extend from the appliance around the last molar of the arch to rest on the buccal surface near the gum, or it is arranged to pass from the appliance over the arch at the junction of two teeth to rest on the buccal surface of a tooth as a molar, premolar, or canine. The *wire clasp* is usually preferred when the conditions are favorable as, when the teeth are well erupted, etc., it can be used without collars but, when the teeth are not well erupted, collars with lugs cemented to the teeth should be employed.

FLAT CLASP FOR ANCHORAGE

A flat clasp made from plate metal has its advantages. It can be shaped to pass between the teeth when desired, at any favorable location for anchorage and, at the same time, extend from the apparatus to rest on the buccal side of a canine premolar or molar, as described.

LOCKING DEVICE

A locking device of an appliance will be mentioned here and more fully referred to later. It has a collar with a buccal lug resting near the gum, cemented to a canine or a premolar and to a molar on each side of the arch. A wire clasp is formed to extend from the appliance over the arch in front (or back) of the canine to engage with the buccal lug, on each of the collars on the canines and the molars, with the ends of each of the clasps terminating in a hook. This form of anchorage is suited for supporting an apparatus for any class of irregularity of the teeth.

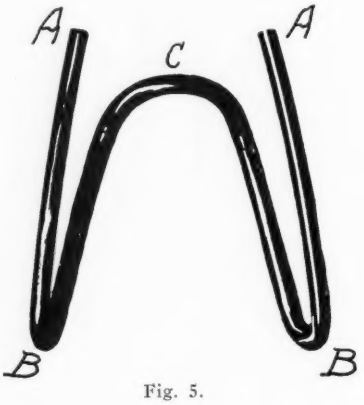

Fig. 5.

BASE WIRE

A Base wire is the foundation of a regulating appliance. It is a large spring-wire of good temper, usually made of *German silver, silver nickel,* or *phosphobronze.* It can be made of any suitable spring metal. The base wire may be a *rigid* or a spring base wire. There are four general forms of base wire—*lingual, palatal, palatal with loop,* and *labio-buccal.* The body and arms of a base wire should be sufficiently strong and rigid, so that they will not be sprung from their normal position, when necessary force is exerted by strong springs which are attached and extended from them for any purpose in moving the teeth.

The different sizes of base wire generally recommended are:

For children between the ages of 3 to 6 years.....No. 13 gauge.
For children between the ages of 6 to 8 years.....No. 12 gauge.
For persons between the ages of 8 to 15 years.....No. 11 gauge.
For persons between the ages of 15 to 21 years.....No. 10 gauge.
For more mature adults, a more rigid base wire.....No. 9 gauge.

LINGUAL BASE WIRE

Fig. 5 shows a lingual base wire for expanding laterally the *mandibular arch.* It forms the framework of a regulating appliance to which springs are attached for any purpose. It is made the same general shape as the *base wire with loop* for expanding laterally the maxillary arch to be described later.

It is formed to follow the lingual curve of the arch just below the margin of the gum back of the incisors and extends backward and downward to the last molars where the ends are bent in a medium-sized curve to extend forward, thus forming arms to rest on partial clasps arranged on the lingual side of the anchorage teeth, to which they are soldered with the wire-clasps or spring clasps, spurs and finger springs.

The action of the appliance is caused by adjusting the springs according to the part of the arch requiring movement. For expanding laterally the *anterior* part of the arch, the ends of the arms of the base wire, *"AA,"* are pressed outward by the hands, or by an *expanding plier,* thus bending the base wire *"BB".* For expanding laterally the *distal* part of the arch, the parts of the appliance at *"BB"* are pressed outward bending the base wire at *"C".*

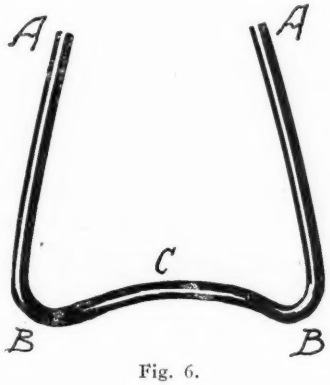

Fig. 6.

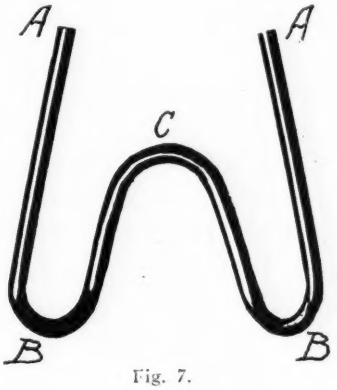

Fig. 7.

PALATAL BASE WIRE—FIG. 6

In the study of the form of the dental arch, it is often predetermined that the distal part of the arch is broad enough.

In practice, it is found that in cases requiring lateral expansion of the dental arch, a less number need expansion of the distal part of the arch, either maxillary or mandibular.

In making a regulating appliance, when only the *anterior part* of the maxillary arch requires lateral expansion, a base wire known as a palatal base wire is arranged to cross the distal part of the arch where it is broad enough, usually opposite the last molars.

The palatal base wire is always shaped to follow the palatine vault of the dental arch, with the ends bent forward to extend to the canines. Arms are thus formed which rest on partial clasps, usually arranged on the lingual side of each of the molars, premolars and canines.

The arms are the foundation and anchorage portions of the appliance. The ends of the metal arms are tapered by filing to make them less bulky. They are

soldered to the partial clasps with the ends of the spring-clasps and finger springs; arranged in this manner the ends of the arms are bent outward from time to time to expand the arch in the region of the canines and premolars, force being caused by pressing outward on the ends of the arms *"AA"* which bends the base wire at *"BB"*.

The apparatus with the palatal base wire following the palatine vault of the arch, as described, is not intended to expand the distal part of the maxillary arch as the palatine curve of the base wire *"C"* should never be straightened or changed for that purpose. It would have more tendency to tip the teeth in their sockets than when a palatal base wire with *loop* is employed.

PALATAL BASE WIRE WITH LOOP—FIG. 7

When the maxillary arch needs general lateral expansion, a palatal base wire with a U-shaped loop is employed. The apex of the loop should always rest deep in the palatine vault, with the sides of the loop extending backward, following the deeper lines of the vault and forming a rather broad outward curve toward the molars on each side; the curve should rest distally a little beyond the line of the last molars, with the ends extending forward forming arms and resting on the lingual partial clasps on the molars, premolars, and canines.

This base wire is similar in form to a lingual base wire, and its action is about the same.

For expanding the anterior part of the arch the ends of the arms *"AA"* are pressed outward, bending the base wire in the distal part of the arch at *"BB"*.

When the distal part of the arch needs expansion, outward pressure is exerted on the sides of the distal part of the appliance at *"BB"* which bends the loop of the base wire at *"C"* increasing the width of the loop. These changes should always be governed by the added measurement as indicated on a *record card.*

An appliance with this form of base wire is adapted for the lateral expansion (or contraction) of either the anterior or the posterior part of the arch as needed, and the expansion can be carried to any desired limit, either with the maxillary or the mandibular arch. This, the writer thinks has not been accomplished as accurately with any other single device.

LABIO-BUCCAL BASE WIRE

A labio-buccal base wire has been used many years in expanding the arch and moving individual teeth. It is a curved bar located on the labial and buccal sides of the dental arch sustained by entering tubes, eyelets or hooks on collars cemented to the teeth, or by spring clasp attachments. The labio-buccal base wire is used for moving the teeth as by ligatures, extending from the bar around the teeth, by attached springs, etc. For retaining the teeth it may be sustained by spring clasp attachments or by spurs projecting from the base wire to enter tubes, eyelets, or hooks on collars or by spurs projecting from collars cemented to the teeth. (Fig. 8.) Its size varies according to the force desired. Many years the author used labio-buccal base wires of various forms, as a plain base-

wire, or a base wire with corrugations, U-shaped loops, etc. The base wire with loops is often the most serviceable.

The palatal and lingual base wires previously referred to are adapted to the particular purpose needed. It will be noted that they are generally of rather large diameter and purposely made stiff, to serve as a foundation for the regulating appliance and to prevent the teeth from moving back and forth in their sockets, as during mastication, while being regulated, and, while being retained. In this manner tenderness is avoided. Often when the teeth are supported only by a small spring, they are easily disturbed in their sockets and become more or less tender, delaying new bone deposits, and consequently there would be an inclination on the part of the patient to avoid necessary normal mastication. Accordingly, with the former plan, there is less tendency to excessive absorption of the alveolar process and less irritation and general tenderness of

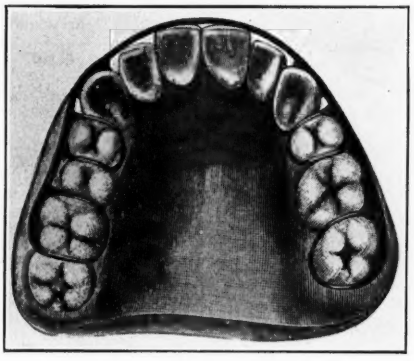

Fig. 8.

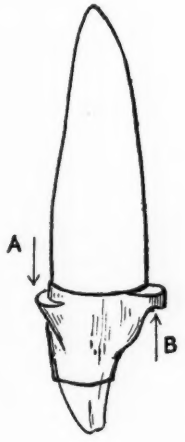

Fig. 9.

the teeth than when small springs are used. As noted, the action of the large spring base wire is controllable and the extent of each movement is limited as desired.

SPRINGS

Springs for moving the teeth as referred to, are made of silver-nickel, phosphobronze, or spring-gold. Any suitable spring metal desired can be used. The sizes usually employed are Nos. 18, 19, 20, or 21 U. S. standard wire gauge.

Springs are usually named according to their shape, position or purpose, as finger springs, loop-shaped springs, semicircular springs, etc., several forms of which are shown in this paper.

SPURS

The appliance is arranged so that it will be *supported* by the teeth to prevent it from resting unduly on the gum tissue. For this, a *wire spur* (Fig. 16) is attached to the body of the apparatus and shaped to extend and rest usually on the crown of a molar and a premolar on each side of the arch.

SHELF

Another method of supporting the appliance that is superior in some respects for this purpose is to attach a *shelf* on the lingual side of each collar used for the anchorage-locking-device, the spur or shelf being at-

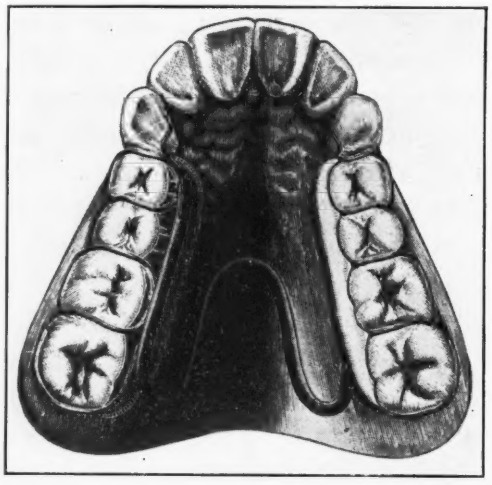

Fig. 10.

Fig. 11.

tached to the gingival edge of the collar near the gum line. (Figs. 9 and Fig. 16*B*.)

A similar shelf is also used in case of *close occlusion* of the teeth and for *moving teeth bodily*. The shelf is usually made of plate metal about 28 gauge, arranged to project from the collar about two millimeters, the parts being properly fitted and soldered in the usual manner. The collar is then cemented to the tooth and a *model made* representing the collar and shelf in place.

The appliance is designed and the parts arranged on the model to rest on the

shelves with the wire clasps extending to the buccal side to complete the anchorage.

When a regulating appliance has been designed, the different parts are always shaped to the model and then assembled, to be united by solder. (Fig. 10.)

SOLDERING—FIG. 11

In soldering, the base wire, spurs and springs are usually held by moldine in position for the soldering and, when necessary, further sustained by pressing steel pins by the side of them into the model.

SOLDER

Chemically pure tin is usually employed as a solder in uniting the parts of the appliance, the tin being fused by a large soldering iron. Before soldering, the parts are *fluxed* with *chloride* of *zinc* or with a *no-korode* flux.

Knowing the detrimental systemic effects of lead, the writer early became convinced that in making these appliances it was not wise to use a solder that

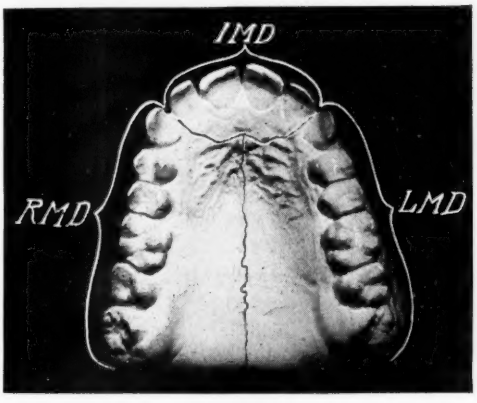

Fig. 12.

contained lead, but he wishes to say that he has never known of any case where harm resulted from the use of such a solder.

When lead is excluded from the metals used in an appliance, it has also been found by long experience that there is less chemical action caused in acid mouths and consequently less oxidation or tarnish of the appliance.

The practice of gold plating or guilding a regulating appliance made in this manner is generally objectionable, as gold, chemically deposited on the whole of an appliance is porous and when bathed in saliva, sometimes develops a chemical action, which causes the metal to tarnish more than when no plating is employed. However, when gold plating is to be used, it is usually advisable to first apply a coating of copper and then a good coating of gold.

DIVISIONS OF THE DENTAL ARCH—FIG. 12

In the study of the dental arch for the purpose of orthodontia, as for expanding the arch or bringing about any necessary correction in the position of the teeth or for any other purpose, the writer has found it an advantage to divide the arch into three divisions, sections, or segments; as, The *Right Max-*

illary Division, The *Left Maxillary Division,* and the *Intermaxillary* (or Incisive) Division.

These divisions of the maxillary arch are the natural divisions as separated and distinguished by the lines of the premaxillary and intermaxillary sutures. The intermaxillary division contains the four incisor teeth. Each lateral division of the arch includes the canine, premolars and molars. The divisions can be symbolized as follows: R-M-D
L-M-D
I-M-D

To complete this system for study, record, and convenience the mandibular arch is separated into similar divisions.

Accordingly in the examination of orthodontic cases, one should determine in what division of the arch the irregularity is located.

The regulating appliances described are also divided into three divisions, constructed to deal with the irregularity presented in each division of the arch.

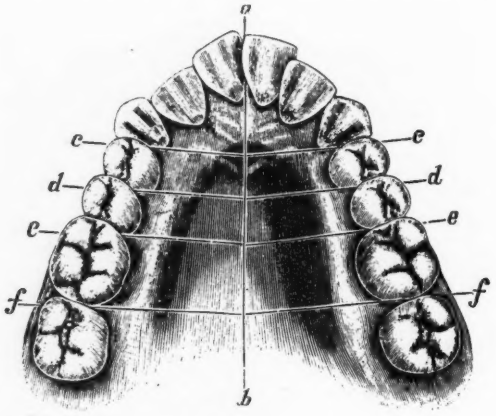

Fig. 13.

EXPANSION OF THE ARCH

When the teeth are irregular, they are usually much crowded in the arch. This is most generally evidenced by there being insufficient space between the canines for the proper arrangement of the four incisors.

Many operators are making a mistake in expanding the dental arch to provide room for the incisors by moving outward the premolars and molars without moving outward at the same time the canines, which are included in the lateral maxillary divisions of the arch.

Fig. 13 is prepared to illustrate the lines of movement of the teeth in properly expanding the arch laterally. It shows that the movement of the molars and premolars in a buccal direction, as illustrated by the lines, "*C, D, E* and *F,*" does not increase the width of the arch anterior to them as required.

Therefore, in expanding the dental arch *laterally,* the appliance should always be arranged to include the canines, if present. With these conditions presented in such a large majority of cases, it has been necessary to devise a *standard* appliance, strong and complete in itself, that is definite, thoroughly efficient and which can be handled. It must have a strong foundation to which

springs are attached, for sustaining the anchorage and for individual tooth movement.

ANALOGY

To impress upon the mind the analogy between removable regulating appliances and the human body, the author will refer to the many necessary mechanical features embodied, their *capability* and their impressive similarity in form and action, an understanding of which he is sure will prove instructive and beneficial.

The base wire is the foundation or body of a regulating appliance. As previously stated, it is made of large spring wire. The portion of the base wire connecting the lateral divisions of an appliance is always rather large and strong; the ends are bent to project forward, (or backward), like arms; they are shaped to rest on the partial clasps, usually on the lingual side of the anchorage teeth.

The base wire or body may be compared to the human body with the arms *extending forward from the shoulders,* as the arms of the base wire extend forward from its body or shoulders. There are fingers on the ends of our arms and, likewise, there are metal fingers arranged to project from the ends of the metal arms of an appliance in the form of springs.

Therefore, in making a regulating appliance, it is essential that it have a strong body, strong arms, and strong fingers, as each is to do a definite work. They should be large and strong enough to move the teeth a definite distance in a given time and not move the teeth further than intended.

If a man be not strong enough to accomplish promptly the work laid out for him, a stronger man is employed.

Following the same idea, one would make a regulating appliance strong, always having it built strong enough to cause the arms and fingers to act definitely in making the desired movement of the teeth and process.

Again, the human body performs all movements by muscular action; in effect, this is similar to the action of the spring parts of the regulating appliance.

The fingers of the human body grasp objects and move them definite distances with ease, following the command of the will.

The plan of this system of regulating is to have an appliance built sufficiently strong and so thoroughly anchored, as to move the teeth in the desired direction, in a limited time.

The analogy mentioned will be apparent in the study of the different appliances presented, thus making some of the details in their description more readily understood.

In *designing* an apparatus for moving the teeth, one would generally be led to adopt *correct forms of metal arms and fingers, etc.,* by first shaping his finger as he would to move a similar object.

ORTHODONTIA AN EXACT SCIENCE

Orthodontia has been recognized as a science, but it is desirable that the different phases of orthodontia be so thoroughly understood as to deduce it

to an *exact science* and that the mechanics be so simplified that any operator of steady judgment can perform at least ordinary operations without overtaxing his mechanical skill.

RECORD CARD

To secure accuracy in applying force for the regulation of the teeth, several years since, the author devised a method of making a *careful pencil-tracing* on a *record card* of each regulating appliance in use before applying force, and indicating on the card a record of the amount of each subsequent change in the

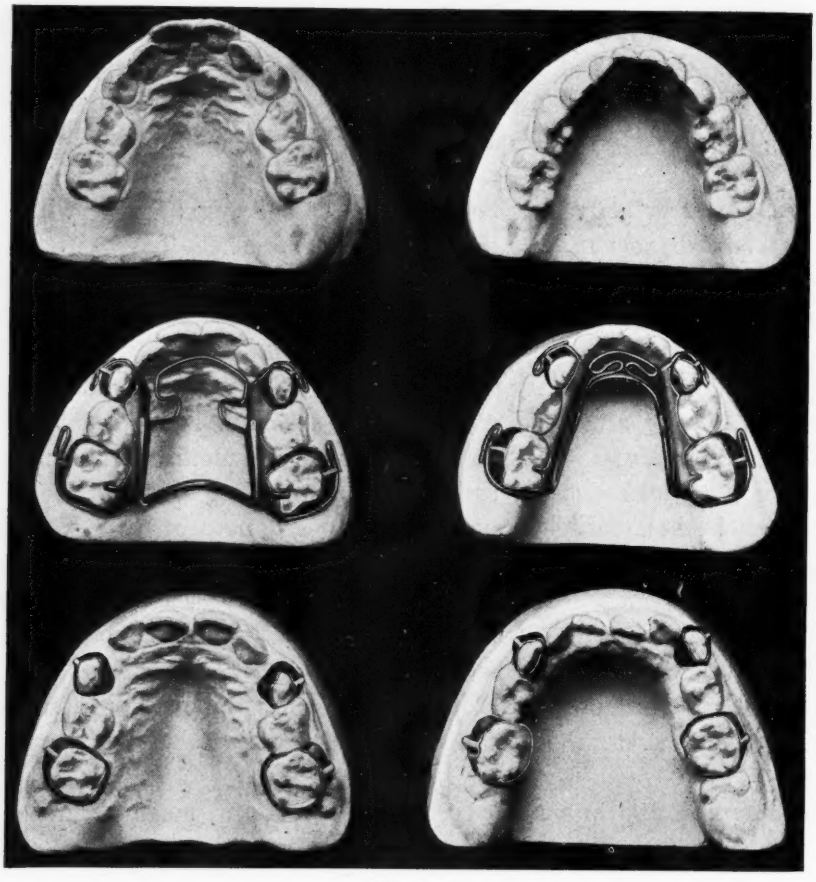

Fig. 14.

appliance for moving the teeth. This would be a *permanent record* of the changes of force applied and the date of the change.* The plan is further referred to in the following.

Fig. 14 illustrates a case with narrow arches and distal occlusion with a maxillary and a mandibular appliance made as previously described and utilized for expanding and equalizing the arches for a child four years of age. The maxillary appliance has a palatine base wire; the mandibular appliance a lingual base wire; force is caused by bending outward the arms and adjusting the springs of each appliance by rule. With these appliances shown, force for the lateral expansion of the maxillary arch would be caused by grasping with

*Jackson, Orthodontia 1904, page 113.

the hands the front end of the arms of the appliance and pulling outward, thus bending the base-wire slightly, which, when inserted in the mouth, would cause force to expand the front part of the arch. In applying force for the *lateral expansion* of the *mandibular arch,* the front ends of the arms should be pulled outward. This would bend the base-wire at the curves opposite the molars which would affect the expansion of the front part of the arch. For expanding the distal part of the arch, one would pull outward on the sides of the distal end of the appliance, which would bend the loop of the base-wire as necessary.

Each of the mentioned changes of form would be governed by the successive measurement indicated on the record card.

As stated a record of the amount of each application of force applied is

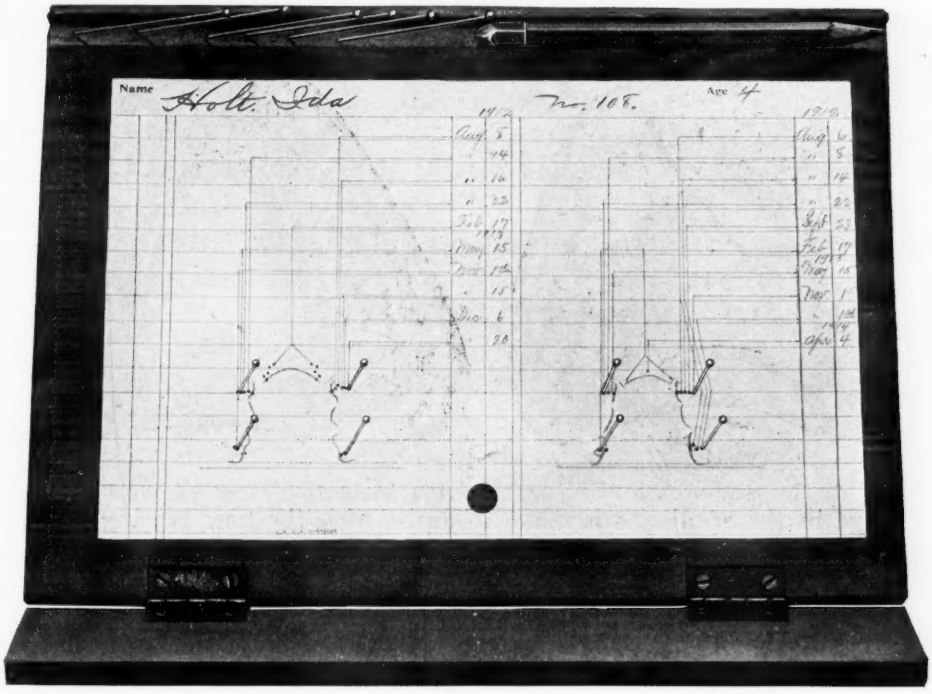

Fig. 15.

recorded on the ruled *record card.* (Fig. 15.) When in use this card is supported by a *tracing board* which usually has a hinged ledge, or shelf, for folding over the lower edge of the card. In registering the shape of the appliance it is placed on the card against the edge of the ledge.

With a sharp pencil a tracing is made of the outer contour of the arms and springs of the appliance. A steel pin 1¾ inches long is then pressed through the card into the board close beside the arms in the location of each of the canines and molars used for anchorage. With a sharp pencil the prick marks in the card are blackened. When force is to be applied, another prick mark is made, usually one millimeter from the first, in the direction it is intended to bend the arm or spring of the appliance, for causing force. The indicated pin punctures are a permanent record of the successive applications of force, generally of one

millimeter. The arms of the appliance are bent outward to rest against the pins after the added measurements. Each of these indicated changes of force is known as a *"step"*. The first step, generally being one-half millimeter, later one millimeter, should be made at intervals of once a week. When the regulating is advanced considerably and it is desirable, visits may be made once in two weeks or even at longer intervals.

In some cases, it is wise not to advance in the movement too rapidly, although a change of more than one millimeter is often made without discomfort to the patient. In the expansion of the arch laterally, it generally requires a change of only a few millimeters. From each step recorded on the record card, a line is extended upward for recording the date of the change.

The card is ruled from above downward, forming columns, and the date of

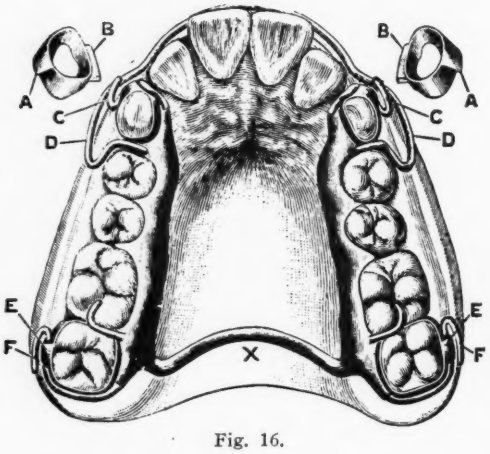

Fig. 16.

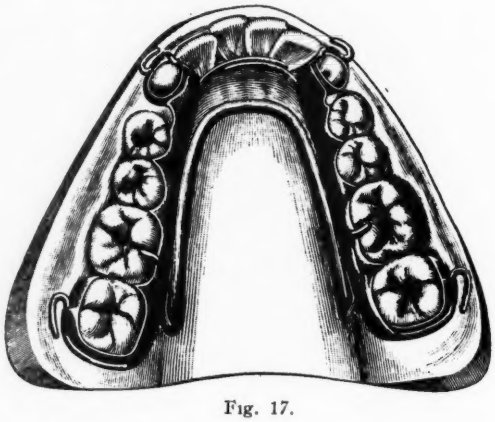

Fig. 17.

the change in the appliance is made to agree with the new tracing and is inserted in the column at the right.

A light line is drawn from the date to the dot mark, which completes the record of the change that is made.

Every subsequent change in the shape of the appliance is recorded by one or more dot marks as required and the date noted in the column in the same manner with a line connecting them.

If a change is made in two or more springs the same date, the lines extending from the dot marks to the date should converge.

With an appliance supported with spurs as referred to, there would be no pressure caused on the gum tissue and by following the plan of the record card, that is, indicating only short distances or *steps* by the dot marks, and leaving an interval of seven days between visits, the patient can be assured that there will be no pain or especial discomfort in the regulation of the teeth.

Generally, only a few definite steps on the *record card* and corresponding changes in the appliance are required to move the teeth as far as desired. Changes for the application of force should never be made by guesswork but always according to the record card.

IMPROVED ANCHORAGE WITH LOCKING DEVICE

The writer will now refer more particularly to the *improved method* of anchoring regulating appliances for the equalizing of the maxillary and mandibular *dental arches,* and which method may be utilized for causing all necessary movements of the teeth.

MAKING APPLIANCES

To make these appliances (Fig. 16) a broad collar with a buccal lug located to rest near the gum in the center of the tooth is cemented to each of the maxillary and mandibular canines, *A.A.,* and a broad collar with a buccal lug located near the gum is cemented to each of the maxillary and mandibular distal molars of the arch *"EE".*

After the collars are cemented in place, accurate plaster impressions of the teeth and models are made; the models represent the collars *with lugs or tubes in place.*

In making an appliance for the maxillary arch, partial clasps are arranged on the lingual side of the anchorage molars and canines, the partial clasps resting on the collars represented in plaster and, when desired, partial clasps are also arranged on the intervening teeth.

When the distal part of the arch is broad enough, a palatal base-wire *"X"* is planned to cross the arch opposite the last molars with the arms extending forward and shaped to rest on the partial clasps arranged on the lingual side of the anchorage teeth.

The appliance is retained to the teeth by wire clasps which are soldered with the partial clasps, spurs and ends of the semicircular spring to the arms of the appliance with *chemically pure tin* by using the soldering iron. Two wire clasps *"FF"* are shaped to extend from the distal part of the anchorage portions of the appliance, one on either side, to clasp the second molars chosen for anchorage. The free end of the clasp is made to pass above the lug *"E"* on the collar and bent backward upon itself, forming a rather long hook.

The wire clasps *"CC"* attached to the anterior part of the anchorage portions of the appliance, one or either side, are shaped to extend over the arch at the junction of the lateral incisor and canine. They fit well in the groove and reach near the gum line on the buccal surface of the canine, where each is bent backward in a curve to pass above and engage with the lugs on the collars located in the center of the teeth. The end of the clasp is curved forward on itself, forming a hook.

The wire clasp passing above the lug on the collar for anchorage completes the *locking device* of the appliance. In this manner, the appliance is held firmly in position for causing any movement of the teeth.

The appliance is easily removed by unhooking or unlocking the clasps from the lugs with the finger, which liberates the appliance. This can be done either by the patient or the operator.

The hook-shaped end of the clasp makes it the best form of attachment to grasp with the finger nail for unlocking the appliance.

A hook of this shape is thoroughly suited for the adjustment of rubber

equalizing bands as for the correction of protrusion of the maxillary arch or for a prognathous mandibular arch.

By the use of an appliance with a palatine or a lingual base wire and a correct tracing to direct the changes, the expansion of the arch is made easy and progressive, *step by step,* in the manner described in connection with the record card.

An appliance for the expansion, or the equalizing of the mandibular arch is made with a lingual base wire No. 10, 11 or 12 gauge. (Fig. 17.) It is anchored to the teeth with wire clasps. The *locking device* is arranged the same as in the maxillary arch for retaining the appliance.

A lingual base wire is shaped to follow the lingual curve of the arch. The front part, back of the incisors, rests just below the gum line and extends backward and downward to the posterior molars where the ends are curved forward, extending to the canines, forming arms to rest on partial clasps arranged on the lingual side of the anchorage teeth.

The ends of these arms are tapered by filing, so that the front anchorage portions will not be bulky, but they are kept sufficiently large to retain their strength.

The arms are soldered with the other parts—partial clasps, wire clasps, finger springs and spurs as described.

Curved finger springs, as shown, are often utilized in reshaping the line of the incisors between the canines.

The appliance is removed by disengaging the wire clasps from the lugs with the finger.

Fig. 18 illustrates a front view of the maxillary and mandibular dental arches with the teeth in occlusion after correction on each of which the appliance is arranged in position.

The plan of the locking device for anchorage and the semicircular springs of the appliance for moving the incisors are especially shown.

EQUALIZING THE DENTAL ARCHES, ANTEROPOSTERIORLY

Fig. 19 shows the original occlusion of the teeth in the case just described and illustrated by Figs. 16, 17 and 18. It shows the receding mandibular and maxillary protruding arches with appliances in place for their correction, by equalizing the dental arches. Fig. 18 shows the case after treatment.

By the term "equalizing the maxillary and mandibular dental arches" is meant the making of the unequal arches equal, so that the teeth of each arch will occlude normally with the teeth of the opposite arch.

In equalizing the dental arches, anteroposteriorly, the distance between the maxillary canines generally needs to be increased to properly accommodate the four maxillary incisors and to permit the mandibular arch to be moved forward as it should be and the maxillary arch moved backward as necessary.

It often occurs in cases of this type of irregularity that the maxillary or mandibular incisors are too prominent and need to be moved inward to complete the equalizing. This is generally accomplished by the use of a semicircular spring with U-shaped loops, shown at *"D, D"*, arranged to pass in front

of the incisors with the ends of the loops attached to the anchorage portions of the appliance.

Added force is caused by closing the loops of the spring slightly at a time.

Should the mandibular canines occlude detrimentally with the wire clasps of the maxillary appliance at any stage of the regulating, the clasps could be changed to pass from the appliance back of the maxillary canines and rest above the lugs on the collars rather than in front of them. The front part of the appliance could then be dressed away as necessary.

Sometimes when the incisor teeth of the maxillary arch are too prominent, they should not be moved inward until the teeth of the lateral maxillary divisions of the arch are forced backward to a normal occlusion in the process of equalizing, after which a labial semicircular spring should be attached for moving the four incisor teeth inward to take a good line with the canines which just previously had been moved backward in the line of the arch. With this plan the normal lateral occlusion of the teeth being first established, the

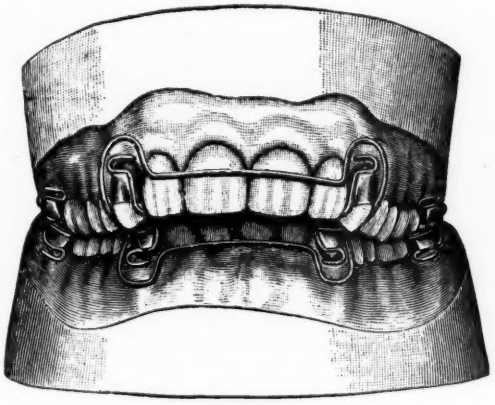

Fig. 18.

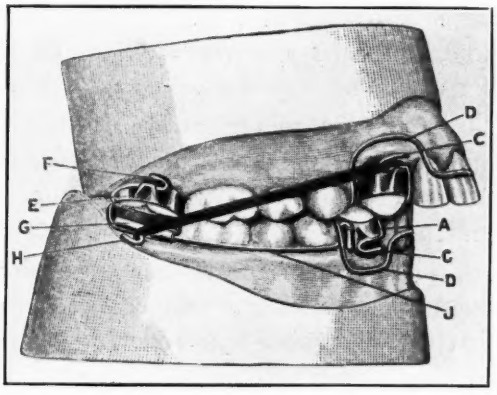

Fig. 19.

maxillary anterior protrusion can then be more thoroughly reduced by moving the incisors inward.

For cases requiring the maxillary or mandibular incisors to be moved outward, finger springs are attached to the anchorage portion of the appliance, one on each side, extending forward in a curve to cause the necessary force, as shown in Fig. 17 or, a semicircular spring with U-shaped loops can be employed for this purpose, it being attached to the anchorage portions of the appliance.

For this and all purposes, the advantage of having regulating appliances built in *divisions,* as the intermaxillary and the lateral maxillary division, will be readily understood.

SUSTAINING BAR—FIG. 19

In equalizing the dental arches anteroposteriorly, it is sometimes necessary to sustain the anchorage teeth in a manner that will keep them in an upright or perpendicular position, while force, as by rubber equalizing bands, is applied for moving forward or backward the maxillary or mandibular arches and during their retention.

For the purpose of sustaining the canines of the mandibular arch, a small *tube* a little shorter than the width of the collar on the canine as shown in the figure, is soldered to the distobuccal surface of the collar, usually in a perpendicular position, there being also a lug on the buccal surface of the collar shown at *"A"* used for anchorage.

A collar with a similar lug is cemented to each of the canines.

For sustaining the molar in an upright position, to the buccal surface of the collar, there is soldered a horizontal tube *"G"*; this is a little shorter than the anteroposterior measurement of the molar to support the end of the sustaining bar and to serve as a lug for the wire clasp *"H"* of the appliance.

Through the tube on the molar is passed a wire, usually No. 18 gauge, extending forward following the gum line to the canine, where it is bent into a small perpendicular loop, the end entering the tube on the collar from above downward. With the bar entering the tubes in this manner, it sustains the anchorage teeth as anterior or distal force is brought to bear on them. The bar is known as a *sustaining bar.* Any other teeth in the arch can be sustained in a similar manner. When it is desired to sustain the anchorage teeth of the maxillary arch, the same plan described would be employed. In either case the sustaining bar is not often necessary.

If the second molars are not sufficiently erupted for anchorage, the collars should be cemented to the first molars, but it is always advisable to have the anchorage of the distal part of the appliance as far back in the arch as is practicable.

The force of the rubber equalizing bands in equalizing the dental arches should be sufficient to cause the movement to be rather prompt, and it is well that the equalizing hooks in the plane of the maxillary and mandibular arches be not located too near together—that is—to have the hook for supporting the equalizing band to the mandibular arch and the hook to hold the band of the maxillary arch a considerable distance apart in order to stretch the equalizing band sufficiently to cause a proper amount of force; at the same time, by having the hooks further apart, the band would not interfere with the patient in opening the mouth, as in mastication, without causing much additional stretch of the equalizing bands.

When more force is necessary, a longer stretch of the equalizing bands can be attained by soldering another wire hook to the molar wire clasp to rest back of the lug on the collar.

The hook is shaped and bound to the wire-clasp by a piece of ribboned metal. The latter is prepared by rolling very thin a soft and small-sized bronze wire. After rolling, one side of the metal should be slightly tinned and wound twice or more around the parts to be joined with the tinned side in, then soldered so that the solder, when applied with flux, will follow the tinned surface of the metal, which would suck the solder in around the wires and make a strong joint. With this plan, the equalizing hook will be extended backward nearly the width of the molar.

Another plan of locating the equalizing hook further back in the arch is to shape a spring wire about No. 16 or 17 U. S. standard wire gauge to be

attached to the lingual side of the appliance and to extend backward as far as desired, then bent in a curve to the buccal side of the arch, where an equalizing hook is attached to rest in line with the buccal side of the molars.

To increase the force of the equalizing bands before the permanent canines are erupted, it is sometimes advisable to attach a rigid wire extension to the front part of the apparatus. This is usually arranged to pass through the space caused by the loss of a deciduous canine or a deciduous molar to the buccal side and to extend forward as far as the lateral incisor and there have an equalizing hook attached. In this case, the front part of the appliance is to be retained to one of the teeth, as a premolar or a deciduous molar, by a locking device in the usual way. When not sufficiently well sustained in that manner, a collar with a suitable labial lug for its support should be cemented to the lateral incisor.

Occasionally, for anchorage, when several of the deciduous teeth in the front part of the arch are absent, equalizing hooks are attached to the loops of a semicircular spring that is arranged to pass in front of the incisors. This spring is retained by a collar with a labial lug, cemented to each of the lateral incisors. When this form of apparatus is used, generally a lingual semicircular spring is adjusted to prevent the incisors from being forced backward in the arch as labial equalizing force is applied. These extensions are applicable to each arch for causing greater force and are necessary in certain classes of cases.

As a greater or less force is often required, it is advisable to keep in stock *equalizing bands* of the same size but of different tensions.

In expanding the arch laterally, as previously described, or in moving the teeth too rapidly, they are liable to become tipped outward abnormally. This is often noticeable as in moving the canines laterally outward in providing more space for maxillary irregular incisors. The tipping can be easily prevented and the teeth moved bodily by the *anchorage-locking device* described. A *spur* or *shelf* of plate metal, such as has been recommended, is attached to the lingual side of the collar used for anchorage at the gum line. The apparatus is made to rest on the lingual shelf, and the wire clasp extending from the apparatus, is shaped to rest above the buccal lug on the collar as shown.

Fig. 9 and Fig. 16 A. By this arrangement, the appliance resting on the lingual shelf and the wire-clasp extending to the buccal side of the tooth and pulling on the lug, the canine is held in a perpendicular position as force is applied in moving it bodily outward. If at any time the canine is not sufficiently perpendicular, the end of the wire-clasp can be made to pull harder on the buccal lug and so force the root more bodily outward, or the force can be gauged to give the canine the position desired.

In a similar manner, a premolar or a molar can be moved outward bodily, by having the appliance rest on the lingual shelf attached to the premolar or molar collar and the wire clasp, shaped to extend from the appliance back of the molar to the buccal side to pull on the buccal lug provided. Added force is caused by bending from time to time the end of the wire clasp so it may pull harder on the lug.

In equalizing the dental arches anteroposteriorly, when there is a considerable force on the mandibular molar caused by the stretch of the equalizing band pulling forward and upward on the lug of the collar, it sometimes tends to tip the crown of the molar inward and the apex of the root outward. When this occurs, it is readily prevented by soldering a lingual lug on the collar facing gingivally, and shaping the appliance to catch underneath the lug. At the same time, a wire clasp that extends from the appliance back of the molar, is fitted to rest or press on the upper surface of a buccal lug provided for righting the position of the molar. When desired, as in equalizing the dental arches, the end of the clasp can terminate in an equalizing hook for holding an equalizing band.

For promptly tipping the tooth more upright, the buccal portion of the spring is bent downward to press more heavily on the buccal lug, while both

Fig. 20.

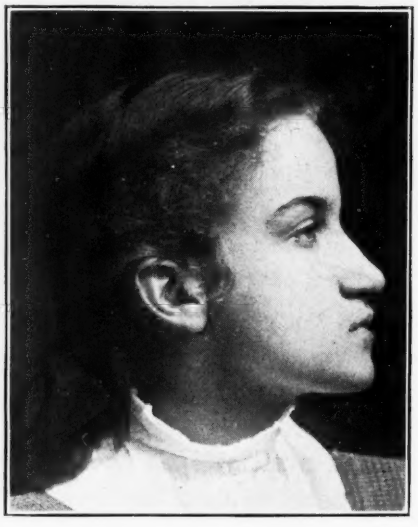

Fig. 21.

this force and the force of the equalizing band is lifting upward on the lingual lug.

In such a case, the wire clasp would be made of larger wire than usual to be sufficiently stiff promptly to cause the necessary force; the force being governed according to the desired amount of bodily movement of the root of the molar, so as to give it a more upright position.

The same principles of anchorage would apply in either of the cases described, and is applicable for causing the similar movement of any teeth in the arch.

When the molar wire clasp is properly adjusted for anchorage, the ordinary force in regulating seldom changes the position of the molar.

In further considering the subject of the equalizing of the dental arches, we shall examine the facial features of one or more cases and call attention to some necessary points in their diagnosis. In cases of maxillary protrusion, it is always advisable to examine carefully the facial line and determine whether the *mandible* is sufficiently prominent, or whether it should be made more

prominent. (Fig. 20.) This is usually determined by the study of the profile facial line, by holding upright with the hand toward the patient, a small pencil or straight-edge, and sight across it so that the line from the eye will rest on the forehead and, at the same time on the point of the chin, and from this determine whether the chin is sufficiently prominent or too prominent

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

to compare with the line of the forehead and balance well with the features. In this case it was determined from examination that the mandible was practically prominent enough. In order to demonstrate this principle more fully, it is usually wise to ask the patient to move the mandible forward as much as would permit the mandibular teeth to interdigitate with the teeth of the maxillary arch as shown in Fig. 21, from which it will be seen by examining the changed facial line that both the mandible and the maxillary arch would be

much too prominent. Therefore, for the correction of this condition, it requires more particularly, the reduction of the prominence of the maxillary arch and, accordingly, in equalizing the arches in this case, the lateral maxillary divisions of the maxillary arch should first be moved backward sufficiently to occlude properly with the teeth of the mandibular arch. With our plan of equalizing the dental arches, this is easily accomplished, as all of the mandibular teeth would form an anchorage for moving backward in the line of the arch, a less number of teeth in the maxillary arch, as the molars, premolars and canines, until they rest in normal occlusion with the teeth of the mandibular arch. The prominent maxillary incisors should then be moved inward to occlude properly with the mandibular incisors by attaching a semicircular spring with loops to the apparatus for the purpose, thus reducing the prominence of the maxillary arch. The intermaxillary force employed should be continued to counteract the force of the labial springs in moving the incisors inward.

There is a vast variety of neglected cases that should be treated by the

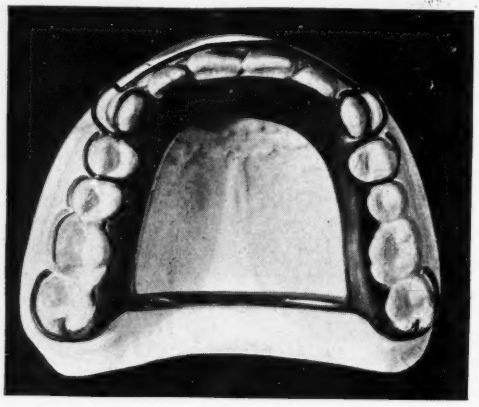

Fig. 26.

orthodontist. He is sometimes called upon to meet extreme conditions. Figs. 22 and 23 illustrate an important example of a trying case. By studied treatment, marked improvement was brought about in the facial lines and in the occlusion, as shown by Figs. 24 and 25.

CHANGES IN THE MANDIBLE

In equalizing the dental arches, anteroposteriorly to any extent, there are always changes taking place in the shape of the mandible, principally at the location of the angle, caused by the necessary intermaxillary force.

It is essential that all details of this movement and changes caused by equalizing the arches be understood by the orthodontist. It is important to him in the diagnosis, the laying out of a general plan of treatment and indicating in the different stages the best method to pursue; as an example, when the mandible arch has distal occlusion, with the incisors antagonizing with the gum just back of the maxillary incisors, or a case with moderate distal occlusion. This condition has been successfully treated by utilizing the normal *occlusal*

force in depressing the lower incisors and, at the same time, changing the shape of the mandible by adding to an upper regulating appliance a *metal shelf* attached to the arms of the appliance. The shelf is shaped to fit the lingual curve of the incisors and project backward enough so that the lower incisors, when in occlusion, would rest upon the shelf, not permitting the molars and premolars to occlude.

In such a case, the appliance should be well anchored and supported to resist the force in mastication. (Fig. 26.) For the latter, a looped spring wire should be shaped to pass around the tapered cusp of each of the upper canines, and rest near the mesial and distal surfaces, with the ends of the wires extending toward the gum passing underneath the shelf to which they are soldered. With this arrangement, the shelf is strongly supported and, when the

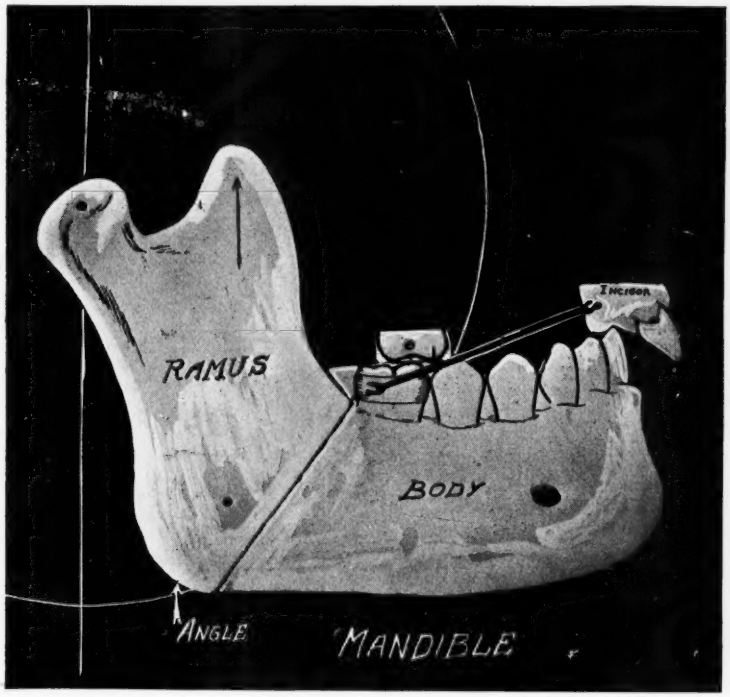

Fig. 27.

appliance is kept constantly in place, would gradually change the angle of the mandible through the force caused by the action of the mandible in attempted mastication with the six mandibular anterior teeth resting on the shelf in occlusion, with none of the other teeth occluding. The shelf is sometimes made level, but when the arches need equalizing, it is tipped forward more or less so that, when the mandibular incisors rest upon the incline of the shelf, they would slide forward drawing forward on the mandibular arch. In occlusion this force, in effect, downward and forward on the anterior part of the body of the mandible gradually causes the angle of the mandible to become more obtuse and the body of the mandible to move farther forward, thereby tending toward normal occlusion.

This change in the angle will be better understood by reviewing the plan

of the development of the mandible and later by its treatment. With the young child the ramus is short and the body of the mandible is short. The body of the mandible in its further development gradually becomes longer from the symphysis to the ramus to accommodate each developing deciduous tooth in its regular order of eruption and continues its development to accommodate each of the erupting permanent teeth in their successive order. The eruption of the third molar seldom occurs before the age of 18 to 21 years. During this time the ramus portion of the mandible is undergoing a similar progressive development at the angle, contributing to the length of the body and ramus. By this it will be understood that the region at the angle of the mandible is in a constant developmental stage from the beginning of the life

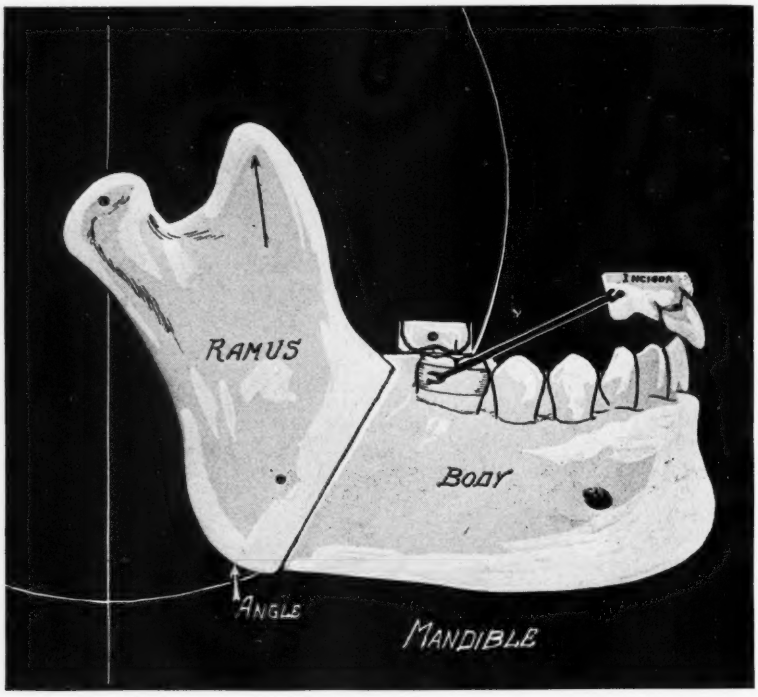

Fig. 28.

of the child to that of the adult, and accordingly, its cellular arrangement during this period is more easily changed by any steady, constant force.

The anatomical changes in the mandible from infancy to old age must always be kept in mind in our diagnosis. The angle of the ramus and body of the mandible in infancy is obtuse and through normal development of the body and the ramus it gradually becomes more nearly a right angle about the adult period or later, but as one advances in life, the angle of the mandible again becomes more obtuse.

Fig. 27. In continuing, cases with more defined distal occlusion require in their correction, intermaxillary force for the equalizing of the dental arches by the use of rubber equalizing bands. As stated, in bringing about normal occlusion, one should fully understand the changes that are to take place in the form of the mandible. In masticating, the normal movement of the angle

of the ramus portion of the mandible backward and forward *scribes a section of a circle.* When the mouth is opened, the angle of the ramus approaches the lowest point of the circle and, when the mouth is closing, the angle of the ramus moves forward in the circle to a higher level. The continued equalizing force in moving the teeth forward to correct the distal occlusion gradually bends and raises the distal part of the body of the mandible and molar teeth upward to a higher level in relation to the incisor teeth which generally antagonize with the gum back of the maxillary incisors, in effect, bending the forward part of the body of the mandible downward. As this is done, the mandibular molars are caused to occlude further forward to a normal position in relation to the maxillary molars by the ramus becoming more obtuse; also the mandibular incisors are brought to a lower plane to occlude normally with the maxillary in-

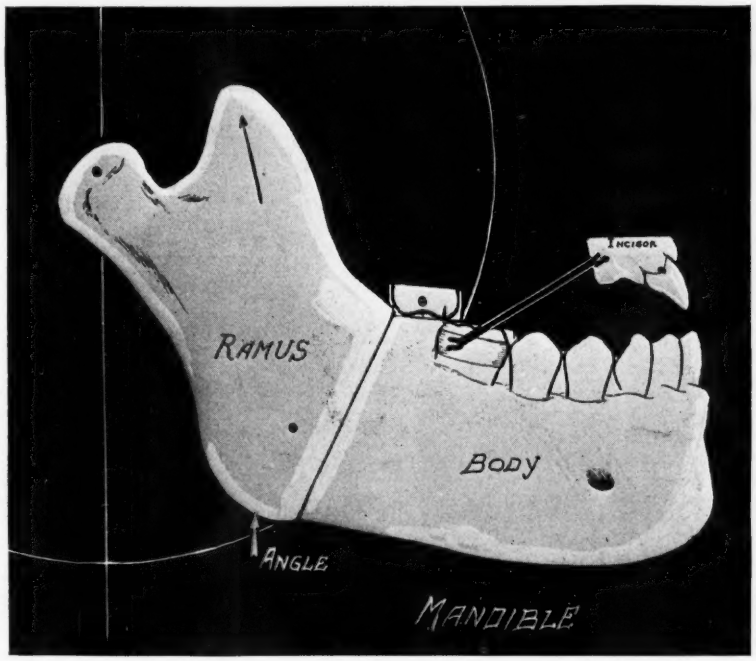

Fig. 29.

cisors (Fig. 28.) This is caused by the lower end of the ramus with the body of the mandible being drawn forward by the force of the equalizing bands attached to the apparatus opposite the maxillary canines and to the distal mandibular molars, the force of which bends the mandible at the angle, thus causing the ramus to take a more obtuse angle in its relation to the body of the mandible.

Through these changes, the ramus retains the same normal temporomandibular articulation through the normal action or strain of the muscles and ligaments, while the lower end of the ramus that joins the body of the mandible, swings forward and upward in the circle as in the act of mastication. The circle that it scribes represents the length of the ramus from its articulation to the angle where it joins the body of the mandible. As the lower end of the ramus at the location of the angle is drawn forward by the force on the teeth in equaliz-

ing the arches, it will be noted that it swings the lower end of the ramus in the line of the circle; this raises the body to a higher level and the farther the teeth and body of the mandible are moved forward by this force, the more the mandible is bent at the angle.

In equalizing the dental arches anteroposteriorly, it sometimes occurs that the continued force in equalizing would cause the angle of the mandible to become too obtuse, resulting in the front part of the body of the mandible being bent downward more than it should be, often causing *lack of anterior occlusion of the teeth,* and at the same time if the force be further continued, it would cause the body of the mandible to move forward too far, tending toward a prognathus condition. (Fig. 29.)

This generally results from a mistake in diagnosis and treatment, as the body of the mandible should not be moved forward in any case during the process of equalizing more than to gain a normal occlusion and a good profile. In equalizing, if lack of anterior occlusion of the teeth is taking place, the equalizing should be discontinued and the mandibular arch sustained, while the teeth of the maxillary arch should be forced backward more to bring about the desired normal occlusion.

In cases when there is a moderate lack of anterior occlusion, the teeth can

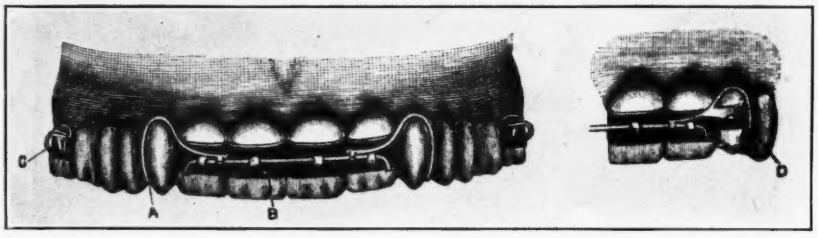

Fig. 30.

be readily elevated for its correction by cementing a collar with a *labial hook* to each of the teeth exhibiting lack of occlusion and extending a wire finger spring from the appliance, usually at the junction of the first premolar and canine to the buccal side of the arch, shaped to follow forward in the curve of the arch to rest in the hooks on the collars provided. The spring should be bent downward from time to time for the purpose of elevating the teeth as desired. (See Fig. 30.)

For additional force, a collar with a hook-shaped spur pointing downward can be cemented to one or more of the mandibular incisors on the canines and an *equalizing band of small diameter* be applied to the hooks arranged in the maxillary and mandibular arches, or the band be passed over the spring extending from the appliance and stretched to the hooks of the opposite arch. When the arches have been equalized and the front teeth elevated, they generally require long retention.

In the correction of lack of anterior occlusion of the dental arches, which generally improves the appearance, it should first be determined from the action of the *patients' lips,* when smiling, whether the maxillary or the mandibular teeth with their sockets should be elevated. A method that has been common

in practice with the *writer* for a considerable number of years in elevating the teeth for lack of occlusion, as of four incisors, and at times including the canines and, when necessary, the premolars and molars, is to cement a collar with a labial hook to each of the teeth to be elevated. For the mandibular arch, the hooks should point downward, and for the maxillary arch, they should point upward.

The hooks are made of plate metal and the ends made long enough to bend around a labial bar. (Fig. 30.) The bar of 19 or 20 gauge is curved and rests in the hooks provided, and the hooks are made long enough to be bent around the bar to clasp it when in place. An appliance with a palatine base wire strongly anchored, as described, has a spring-wire arm extending from the appliance over the arch at the junction of the canine and premolar and extends forward on the labial side close to the teeth near the gum where the arm terminates in a side bend to hook over the bar and back of it, between the central and lateral incisor, one arm on each side of the arch. The arms are to be bent

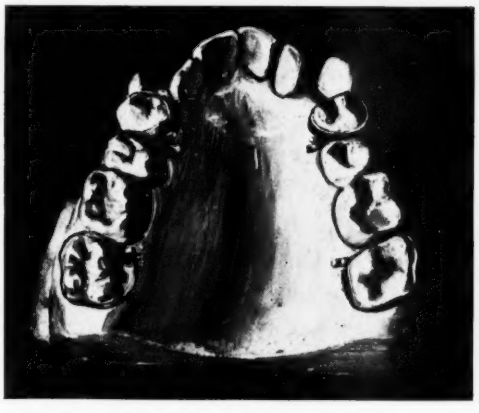

Fig. 31.

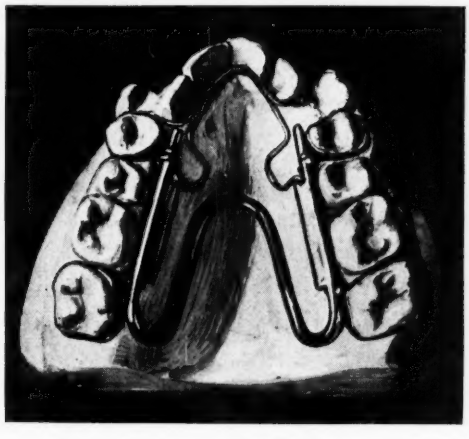

Fig. 32.

downward or upward, a little at a time once a week as required for the elevation of the teeth. The appliance is readily removed by unhooking the springs from the bar. This is convenient both for the patient and the operator. The plan is especially suited for moving the teeth and for their long retention. An appliance of a similar plan is utilized for the depression of incisors.

Cases of *true prognathism* accompanied with *lack of anterior* occlusion can usually be corrected by the uninterrupted application of external force on the mandible over the mental process at the symphysis by the use of a *chin cap* and *cranial cap,* causing the ramus to become less obtuse, permitting the body of the mandible to bend upward with the incisors, bringing about normal occlusion.

A SPECIAL FORM OF A REMOVABLE REGULATING APPLIANCE

The appliance to be described is arranged for the treatment of a case with narrow maxillary arch with prominent canines, the lateral incisors now resting near the first premolars, requiring the general expansion of the arch for the full accommodation of the canines and establishment of good occlusion.

For anchorage, Fig. 31, there is soldered to a collar a U-shaped piece of plate metal or a small loop of wire about No. 16 with two short *projecting arms or spurs* extending lingually, one above the other. One arm is slightly longer than the other to act as a shelf for sustaining the base wire of the appliance, the shorter one holding it in position.

These spurs often in the form of a *wire loop* are generally attached to the lingual side of a collar cemented to each of the anchorage teeth, usually the first premolar and distal molar on each side of the arch, the loops in this case being attached to the collar rather near the junction of the teeth to permit the base-wire of the appliance, when in place, to rest on the surface of the collar and side of the anchorage teeth.

Fig. 32. With an appliance anchored in this manner, *tubes* for supporting springs for moving individual teeth can be attached to any part of the base wire, or the springs be soldered directly to the base wire. The appliance can be easily removed for making necessary changes and readily readjusted.

With the appliance illustrated, a *tube* is soldered to each arm of the base wire for sustaining the ends of the lingual semicircular spring with U-shaped loops. To the semicircular spring back of the central incisors at the median line is soldered a small additional curved spring with the ends projecting like arms resting on the lingual side of the central incisors and laterals with the ends terminating on the distal surface of the latter. The free ends of the spring or arms are bent outward from time to time for moving the laterals outward and forward, while all of the incisors are forced forward as desired by opening the loops of the semicircular spring. At the same time, the arch is being expanded laterally by opening the loop of the base wire.

Fig. 33 outlines the full plan of the appliance. It is readily removed from the teeth by grasping one arm opposite the second premolar and forcing it lingually a little to unlock it from the spurs on the collars described. As the appliance is removed, the semicircular spring can be withdrawn from the tubes to permit any necessary change of form of the spring or of the base wire. The appliance is readily readjusted to the teeth by placing one of the arms of the base wire into the U-shaped supports on one side of the arch, pressing in that direction on the other arm of the appliance to lock it in the U-shaped supports on the other side of the arch.

ANOTHER FORM OF ANCHORING APPLIANCES

A desirable plan of anchoring a removable appliance with tubes or eyelets on collars cemented to anchorage teeth, having any form of base wire to which springs may be attached is given below.*

"When one is accustomed to the use of collars for anchorage, this system is utilized by anchoring a base wire as follows: A collar, with a tube soldered on the lingual side, is cemented to a distal molar and to one of the bicuspids on each side of the arch. The tubes can be arranged on the collar at any angle varying from the horizontal to the perpendicular. A heavy lingual or palatine base wire is held in place by soldering to it a small, strong wire in position to

*Jackson's Orthodontia, page 88.

enter the tubes. Wires entering the tubes on the molars are sometimes arranged to hook into the tubes from the distal end, while similar wires are attached to the base wires to enter either horizontal or perpendicular tubes on the bicuspids. When tubes are arranged perpendicularly on the collars, they are generally inclined a little either forward or backward to improve the anchorage, so that when force is applied, the apparatus will not become dislodged. A labio-buccal base wire is anchored in a similar manner. When desirable, all of the tubes can be arranged perpendicularly. The anchorage teeth are prevented from rotating, when extreme stress is put upon them, by soldering the tubes on the

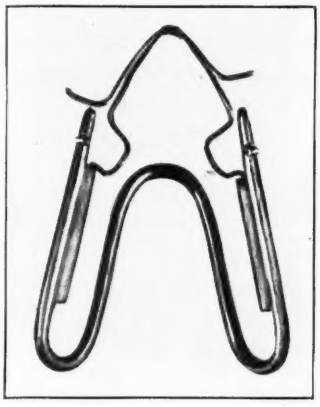

Fig. 33.

mesio-lingual or the disto-lingual surface of the collar, according to the strain to be applied.''

The author has endeavored to present in this paper the more important principles of his system of orthodontia and trusts that the suggestions may be of permanent value.

DISCUSSION

Dr. L. J. Porter, New York City.—I had the privilege of looking over Dr. Jackson's paper although I shall not attempt to discuss it, because I feel that I am incapable of discussing the principles of the Jackson appliance from the little experience I have had with it. However, there is one question which I would like to hear discussed, and that is the question of changing the angle of the mandible. I think it has been said by some of the bigger men in our profession that in carrying the mandible forward, the condyle will slide forward in the glenoid fossa. If that is true, we can show better by Dr. Jackson's apparatus there what I mean. If the whole mandible is carried forward, will not the condyle slide forward in the glenoid fossa? If the mandible is held in position and the lower part of the mandible is carried forward, the angle of the mandible undoubtedly changes, but if the mandible at the same time is being carried forward in the glenoid fossa, will not the anterior teeth resting on that bite plate be depressed before the angle of the jaw is changed by muscular action before the elastic ligature is used?

Major Joseph D. Eby, Washington, D. C.—There has been a most peculiar sense of pleasure and feeling of gratitude mingled in my thoughts which I have enjoyed while sitting in this audience and following Dr. Jackson in his paper, after three years away from active orthodontic practice although busily engaged in work involving the active principles of the science.

My thoughts, the while, have been racing back through the vista of fifteen years' as-

sociations with Dr. Jackson's system employed in active practice, recalling his many acts of kindness, his glowing friendship, what his work has really meant to me and—the thousands of his appliances which I have made.

It would be inappropriate at this time to dwell on the evolution of orthodontic apparatus further than to call attention to some points which are relevant to this paper; viz, the fact that present-day working apparatus can be no longer classed into the two former divisions—"Fixed" and "Removable."

Our present knowledge of the correct control of tissue changes in the physiological processes attending tooth movement by mechanical stimulation has substantiated the active principle which Dr. Jackson recognized in his first efforts to produce an apparatus employing the accurately measured liberation of spring and elastic forces.

Science is solving the question of the dynamics of orthodontia so that progressive thoughts must turn from autocratic and arbitrary ideas and become centered, not upon the kinds of forces to use, but upon the questions of anchorage, design and control of stimulation, not power, the very thing which the Jackson system has embraced for years.

Now since modern progress has brought practically all useful appliances to meet on this common ground, the fact exists that Dr. Jackson's present apparatus are equally as stable in anchorage, stationary in applied stimulation and none the less dependent upon the patients' cooperation than any other appliances using adjustable springs, contemporaneous points which have been until recently generally acclaimed as disadvantages.

Mechanically, the modern Jackson apparatus requires a mastery in technic of construction, more so, perhaps, than many other appliances which embody similiar principles but when once the skill is developed by the operator, the following advantages are to be found:

1. Relative ease of construction.
2. Great latitude of design.
3. Ease of insertion.
4. Exact control of stimulation.
5. Ease of alteration to meet advanced conditions.
6. Durability.
7. Favorable location.
8. Remarkable balance between the problems of anchorage and applied forces.
9. Comfort to patient and operator.
10. Accurate control and adjustment.
11. Hygienic.
12. Volume and quality of production.
13. Excellent retainer.
14. Aids the forces of occlusion.

There are many other salient points about Dr. Jackson's appliance, one other, at least, to which I desire to call special attention: In the majority of malocclusions, there are certain segments in arches, particularly in the posterior regions, wherein certain groups of teeth are in correct relations and if they are shifted en masse, the phenomenon produced in the alveolus is altogether different from that made by an appliance which acts against the teeth individually.

In the Jackson apparatus, the side arms or the extended "finger" springs may be made to engage groups of teeth so as to transpose them in a block movement.

Radiographic observation of this condition invariably reveals the fact that the socket lining, the lamina dura, or the pericemental lamella, remains intact and tooth movement results from the absorption of more cancellous alveolus adjacent. In comparing this advantage with individual tooth movement, some of the following facts are suggested:

1. Movement expedited.
2. Teeth retain alignment.
3. Dentinal ligament, peridental membrane, laminated socket lining uninjured.
4. Retention more rapid and assured.

It seems to me that this is a point in tooth movement to which due regard has not been paid, should be one of the most important points in selective design of apparatus and in arch stimulation particularly, is practically idealized in the Jackson system.

The observations which Dr. Jackson makes in the changes occurring through the angle of the mandible in equalizing the occlusion, whether by anterior or posterior movement of the mandible are correct to my mind and the manner in which he has demonstrated it with the diagrammatic model is most unique.

I first awoke to the full realization of this truth after hearing a paper read by Dr. Chalmers J. Lyons entitled "Impacted Lower Third Molars" in which he elucidated this point beautifully from the standpoints of development and the causative agencies which produce the condition of impaction.

One of the most substantial points to consider is the fact that the ramus is composed of two very heavy plates of corticle bone with very little medullary process between them and is posed to best resist any transitory changes in response to mechanical stimuli made either anteriorly or posteriorly.

It is true that the neck of the condyle is made of cancellous bone but this is only evidence to the fact that owing to its heavy investiture in connective tissue (being fractured much less frequently than the angle) makes it far more resistant than at that point where the ramus and body merge. Dr. Jackson's observations in changes at the angle have been further demonstrated (painfully) in the follow-up treatment of numerous gun shot wounds through the angle in which soldiers had worn "open-bite" splints for several weeks, in all of these cases where solidification had taken place, an artificial prognathism and open-bite nonocclusion existed, requiring tedious orthodontic treatment to correct.

This fact in its simplest interpretation, demonstrates that the elevating and depressing muscle groups must be reckoned with and that the angle is the center of compensation between them.

If it is remiss for me to depart from the thoughts in the paper, I desire to receive indulgence while I express a thought which has weighed very heavily in my mind for several years and in so doing, I am sure I am expressing similar feelings of hundreds of others.

Since the publication of the first edition of Dr. Jackson's book, he has so completely revolutionized so many parts of his system until the orthodontic world is asking for knowledge which can only be gained in glimpses when Dr. Jackson presents something personally. If, instead of devoting his life to the comparative few whose privilege it is for him to serve, he would only produce a modern illustrated text in the form of his second edition, he would record for our profession and to human kind a contribution, not only needed at present, but by the generations to come, thereby engraving his name more everlastingly into dental history and gaining the fullness of the reward which his great life's work so nobly merits.

Dr. William H. Gilpatric, Boston, Mass.—I have a set of slides illustrating the different apparatus and their various movements, but the hour being so late, and not wishing to encroach upon Dr. Case's paper, if you will allow me, I will show one or two cases illustrating the different types of movement and have the remainder printed in the Journal.

One point Dr. Jackson did not emphasize, and that is the importance of registering pressure applied to any appliance. It is my opinion that with every appliance used, we should be able to control the forces, and know the amount of tooth movement in a given time.

Another point which Dr. Jackson did not lay sufficient stress upon is the importance of using large base wires and large finger springs. It was my opinion, at one time, that Dr. Jackson was using too heavy a base wire and finger springs, but after a thorough trial with smaller ones, I am convinced that the heavy base wires and finger springs, which he recommends, are superior for cell stimulation. Some of the men who are unfamiliar with the Jackson appliance criticize the heavy base wires on account of bulk, but in the past fifteen years, I have used the Jackson appliance in the mouths of physicians, teachers, and vocalists, and have never had a complaint.

One of the great advantages of the Jackson appliance is the ease with which repairs and additions can be made.

After the appliance is made, we gold plate it with 24 karat gold, and on each appointment, the patient's appliance is immersed in a saturated solution of cyanide of potassium.

During the past few years, there has been a great land-slide towards the removable retainer. A retainer of this type is more easily constructed, more easily adjusted, and less liable to breakage than the vulcanite.

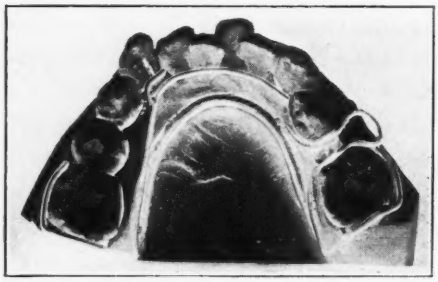

Fig. 1.

Fig. 2.

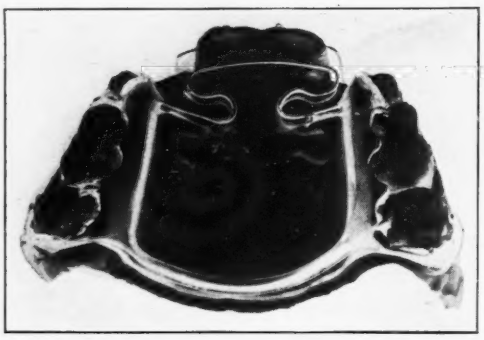

Fig. 3.

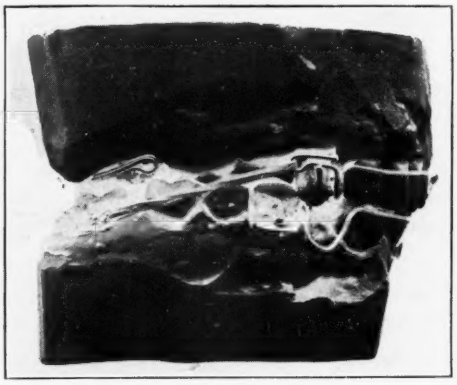

Fig. 4.

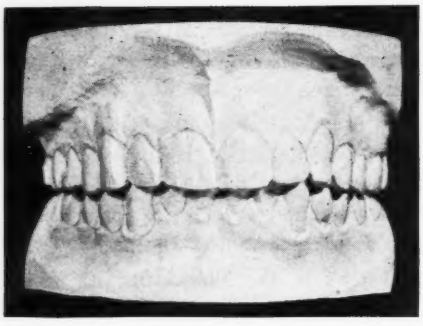

Fig. 5.

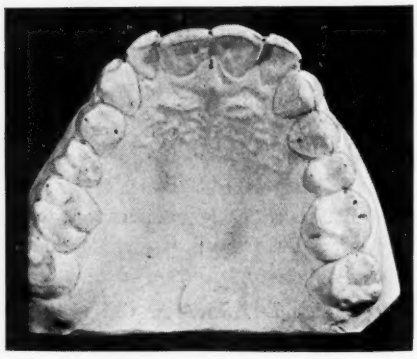

Fig. 6.

The slides which I shall show are of practical cases, made from working models, that is, after the appliances are constructed, we photograph both models and appliances, before placing the latter in the mouth.

Fig. 1 illustrates an appliance with a loop to open up space for an impacted second bicuspid and to move the first bicuspid and cuspid mesially. The anchorage for the appliance is obtained from the left six-year molar, first and second bicuspid and cuspid. On the right, from the six-year molar.

Fig. 2 illustrates the new Jackson anchorage so-called, although Dr. Jackson has used this for the past 15 or 20 years. The upper has collars upon the six year molars and the temporary cuspids. The lower has the same anchorage.

Fig. 3 illustrates the appliance constructed upon the model. (Note the inside semicircle against the centrals.)

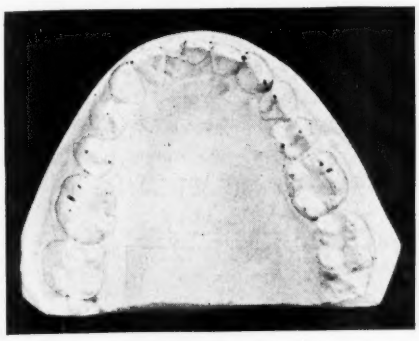

Fig. 7.

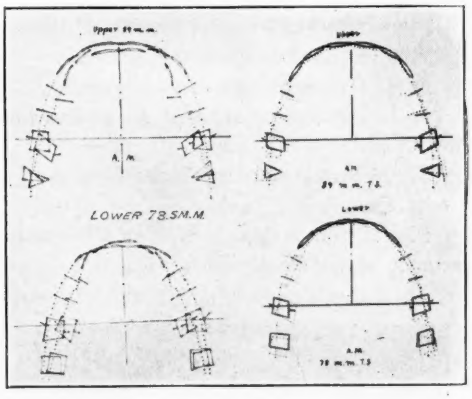

Fig. 8.

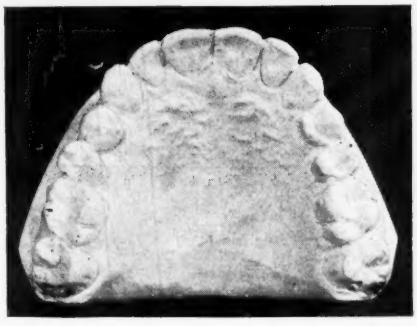

Fig. 9.

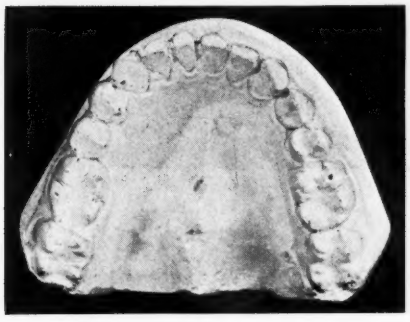

Fig. 10.

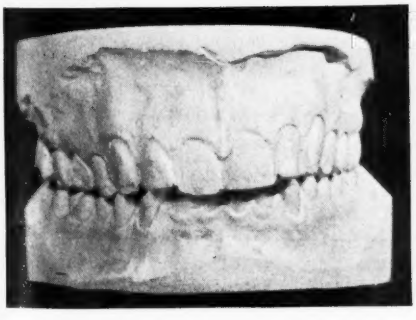

Fig. 11.

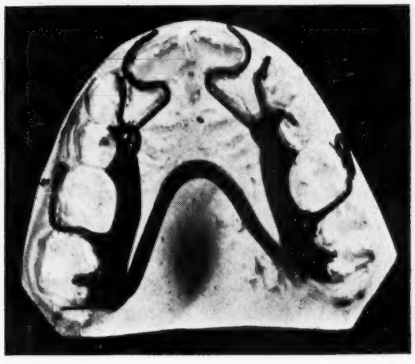

Fig. 12.

Fig. 4 illustrates the models in occlusion, appliances in place with the intermaxillary rubbers. (Note the labial wire on the lower to relieve pressure from temporary cuspids.)

In these mesial occlusion cases you have the resistance of four teeth on each side plus the two centrals as the palatal wire rests at the gingival margin and the labial wire at the inside edges.

Fig. 5 illustrates the case of a young man 19 years of age with excessive overbite so that in masticating his food he was shearing off his lower anterior teeth.

Fig. 6 shows palatal view of same.

Fig. 7 shows lingual view of lower.

Fig. 8 shows the surveys of the upper and lower arch, on the left side, right side, progress to date.

Fig. 9 shows the palatal view of the same case to date.

Fig. 10 shows lingual view of lower.

Fig. 11 shows models in occlusion. Note the change in overbite due to the tipping buccally of the lower molars and bicuspids, and the correct moulding of the upper and lower arches.

Fig. 12 illustrates appliance for the expansion of the upper and the bringing together of the centrals.

Fig. 13 shows appliance upon a lower model with individual finger springs for individual movement of the bicuspids.

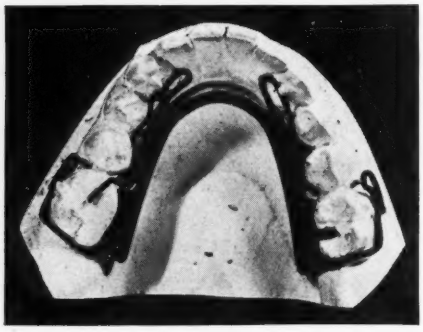

Fig. 13.

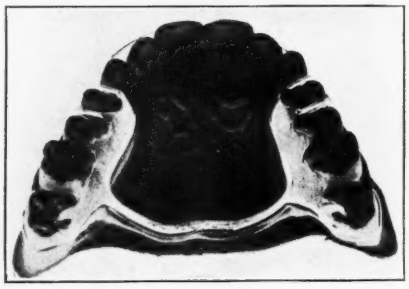

Fig. 14.

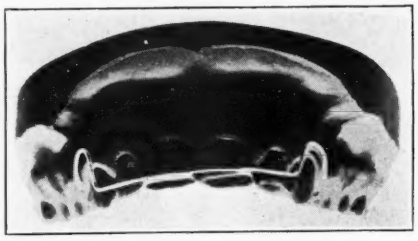

Fig. 15.

Figs. 14 and 15 illustrate a retainer to retain the molars and bicuspids with a labial wire to prevent the anterior teeth from moving mesially.

There is a final point I wish to emphasize and that is, in case too much force is applied, the appliance can be removed.

I wish to express my gratitude to Dr. Jackson for all the inspiration and help he has given me. I assure you it was a great honor to have the privilege of being associated with him in his office.

Dr. Jackson (closing the discussion).—In replying to Dr. Porter's question: "If the whole mandible is carried forward, will not the condyle slide forward in the glenoid fossa?"

This is an important question and should be thoroughly considered and understood. It is nature's plan that the condyles of the mandible be held back in the glenoid fossa as far as they can rest through the action of the *sustaining muscles.*

In incising the food and, in speaking, the mandible is necessarily moved forward by the action of other muscles as required, which puts the sustaining muscles on the stretch. A similar effect results when equalizing force is applied to the teeth. Continued force for

equalizing the dental arches, drawing *forward* on the teeth and the lower end of the ramus, while the sustaining muscles are on the stretch, drawing *backward* on the condyloid portion or upper end of the ramus, gradually causes the angle of the mandible to become more obtuse.

In equalizing the dental arches it occasionally occurs, when this force is applied continuously for a considerable length of time, that the sustaining muscles supporting the upper end of the ramus become exhausted from this, a too exacting force, permitting the condyle to be drawn forward as far as the capsular ligament will allow. By this relaxation of the sustaining muscles, the mandible is often permitted for the time, to rest farther forward than would be a normal occlusion of the teeth, when by the operator's examination of the occlusion at this stage, finding the mandibular arch resting anteriorly, he might be deceived by the position of the teeth and conclude that the angle of the mandible may have become too obtuse, when in fact it had not been changed. This being the case, the equalizing should still be continued, until the angle of the ramus becomes sufficiently obtuse to cause the condyle to rest normally and, at the same time have normal occlusion of the teeth.

As stated, when the equalizing force is removed and the condyle is fully at rest, it should normally be held back as far as can be in the glenoid fossa by the sustaining muscles.

In diagnosis, when this is doubtful, the condition should be fully determined by the operator and, if the muscles are still inactive and it is difficult for the patient to move the mandible backward at will, the sustaining muscles are usually brought into action for that purpose, by inducing the patient to laugh or to swallow, which invariably stimulates the muscles to draw the condyles of the mandible back to a normal position. Then the operator would know by examination of the teeth, whether the desired normal occlusion, as required, is being established as result of the angle becoming more obtuse.

Dr. Porter in discussion also asks: "Will not the anterior teeth resting on a bite-plate be depressed before the angle of the jaw is changed by muscular action, before the elastic ligatures are used?"

In my paper, I referred to depressing the incisors with their alveoli by the use of an upper lingual shelf attached to any ordinary regulating appliance. This is an important method of depressing incisors especially for young patients when a moderate change is required.

The angle of the mandible is often changed by this plan of treatment particularly when the shelf of the appliance is arranged to project downward and backward, in effect in occlusion, pressing forward and downward on the mandibular incisors and canines, and when used continuously for some time.

When a more excessive change of the angle and depression in the region of the incisors is required, in addition to the occlusal force of the mandibular teeth on the shelf, the equalizing force should be employed.

Dr. Eby has understood the principles of my plan of constructing and managing regulating appliances so well and from his experience has spoken so enthusiastically about the value of the plan that I desire to commend his discussion. I am pleased that he has mastered the subject and has presented it so thoroughly in his teaching, that he has an unparalleled following of enthusiasts.

Dr. Gilpatric's presentation and discussion is in full keeping with the purpose of my paper and I want to thank him and each of the speakers for their thoughtful and kind consideration of the subject and of me. I have been extremely anxious to so perfect my appliances that their use may conduce to the true welfare of humanity.

LAWS OF BIOLOGY REGARDED AS ETIOLOGIC FACTORS IN MALOCCLUSION*

By Calvin S. Case, M.D., D.D.S., Chicago, Illinois

GENERAL PRINCIPLES OF BIOLOGY

BEFORE proceeding to a study of those malocclusions which arise partly, and to a large extent, from some form of heredity, it is important for the student to be informed in regard to the general laws of biology upon which is dependent the entire scientific basis of that which pertains to this branch of our subject, so that he may have a more intelligent appreciation of the various propositions presented along this line.

The science of biology lies at the very foundation of all knowledge pertaining to living things—their origin, development, propagation, and all coordinating and environing influences. Unfortunately, the principles of biology and general evolution are quite commonly regarded, even by people who pride themselves upon their education, as of no more practical value that the sciences of astronomy and geology; whereas, there is no branch of learning which enters so intimately and extensively into other branches that are regarded as the essentials of life and education.

While this is particularly true in the general practice of medicine and dentistry, there is no branch in which the laws and principles of biology are of such importance as in the study of the causes and treatment of malocclusion and dento-facial disharmonies, because they present an authentic foundation for a broader understanding and application of the possibilities of ethnologic influences in the admixture of different types of races, and in the union of physical disharmonies everywhere. Therefore, a brief epitome of biologic laws seems essential to an intelligent comprehension of certain principles which enter so largely into the etiology of malocclusions. It is hoped, moreover, that this will stimulate students to a more extensive study of this important branch of literature.

Biology and biologists deal only with the natural laws of organic evolution. By long, patient, and scientific investigation, biologists verify every proposition over and over again before it is stated as a scientific truth. These pertain principally to the problems of life, heredity, variation, natural selection, and influences of environment.

Every anatomic form or structure—barring inhibited development—which arises from the *Law of Heredity* is laid down in the metabolic activities of the

*This article is revised from the third of five chapters of Part II, entitled "Etiology of Malocclusion" in the forthcoming revision of "Dental Orthopedia" by Dr. Calvin S. Case. The first chapter entitled "Etiologic Principles of Malocclusion with Reference to Treatment," was published in the September number of Dental Items of Interest; and the second chapter entitled "Etiologic Influences of Deciduous and Erupting Permanent Teeth with Principles of Treatment" was published in the March issue of this Journal. The titles of the subsequent chapters, which we hope to publish in consecutive numbers in this Journal are: "Heredity and Variation Ethnologically Considered," and "Practical Application of Biologic Laws."

germ cells at the time of fertilization, and forced upon the offspring by the laws of reproduction.

Fortunately, there is another law which is quite as important in biologic development as the law of heredity. This is the law of *natural variation* which also lays down in the germ cells the elemental beginnings of variations which arise in the offspring that differ from the parental stock and like those of heredity are capable of being propagated to future generations.

The other two laws, *Natural Selection* and *Environment* may be said to act extrinsically—the one being Nature's selection of those whose qualities are best adapted to the environment and propagation of their kind; and the other deals purely with adaptive variations in structure, etc., which fits them a little better to live and thrive in the environment into which they are thrown.

This presents two important truths: First, no physical form or variation in anatomical structure can arise except through the channel of the germ cells, though the environing influences upon already endowed properties of the individual after birth may result in a more adaptive degree of development. Second, it shows the impossibility of appreciably increasing the inherited sizes or forms of any of the bones by local or environing stimulation.

HEREDITY

The *Law of Heredity* is that which determines the propagation of physical forms, structures, peculiarities, and even traits of character. Its importance along these lines is clearly related by J. Arthur Thomson, of Aberdeen, in his recent book, *Heredity*: "There are no scientific problems of greater human interest than those of heredity; that is to say, the genetic relation between successive generations. Since the issues of individual life are in great part determined by what the living creature is, or has to start with, in virtue of its hereditary relation to parents and ancestors, we cannot disregard the facts of heredity in our interpretation of the past, our conduct in the present, or our forecasting of the future."

Those who have not given much thought to the subject of heredity are accustomed to think only of *direct* heredity, or the inheritance of some physical peculiarity or characteristic which had its existence in one of the parents; whereas, this is only one of the many forms of heredity. It may be a blending or composite union of quite distinctively different features or family types belonging to both parents harmoniously or disharmoniously united in the offspring; or it may be that the undiluted forms or features of one parent will be found closely associated in the offspring with the characteristic features of the other parent, as the large nose, ears, jaws, or teeth of one parent in connection with the smaller and more delicate features of the other parent.

How often do we see beautiful children from homely parents, because of the transmission to the child of those special features of the two physiognomies that harmonize in union? On the other hand, how often do we see plain and homely children from parents whose physiognomies individually are symmetrical and attractive, because of the transmission to the child of a combination of the features of both, which being dissimilar in size are inharmonious in union? As

the osseous framework is the principal medium that characterizes the various forms, even the large teeth of one parent and the small jaws of the other—though never claimed as more than a rare occurrence—will probably continue to be placed among the causes of irregularities by intelligent dentists, especially as it can be so easily verified.

The condition in question may be some physical or mental peculiarity which had no existence in either parent, but which obtained in some more distant forebear. This *Atavistic Heredity* may have passed without recurrence through many generations, to suddenly manifest itself in the offspring without any apparent known cause; or it may have arisen from an exceedingly complicated propagation under the forces of natural sexual selections, similar to that which is produced by artificial selection or hybridizing, demonstrated by what has been achieved in the past in regard to horses, cattle, poultry, pigeons, fruits, flowers, etc.

Among the vast number of trial and experimental efforts along this line, there has been discovered a number of almost unbelievable laws of heredity which are as dependable, when the exact requirements are fulfilled, as *direct heredity*. One of these is known as "Mendel's law." A further consideration of the subject of heredity in its various phases and practical application to diagnosis and treatment of malocclusion, will be found in other chapters.

NATURAL VARIATION

Next in importance to the laws of *Heredity* is the law of *Natural Variation,* without which everything would have repeated itself from the start, and consequently there would have been no science of biology or organic evolution. One of the stable peculiarities of all living structures is the production of variations in otherwise original hereditary forms and characteristics. These *natural variations* which innumerably arise in all living things are commonly very slight, varying in degree from the almost indiscernible to marked or anomalous modifications from the typical or inherited type. All *natural variations* invariably arise during the metabolic activities of the germ cells in both plants and animals, and when once started are under the same transmissible laws of heredity as those of the established lines of heredity; the difference being, the latter are not so likely to become extinct because of their established adaptability to environment; whereas, *natural variations* are quite likely to be unnecessary, or opposed to their environment, and, therefore, not being stimulated toward continued development, soon die out in future generations. On the other hand, the variation may be one which more perfectly fits the individual for the struggle of life and a higher adaptation to the requirements of environment. In this event, the variation becomes one of the stable forms of heredity, along with other variations which have arisen in the same way, thus fulfilling the highest function of this particular law in the great work of evolution, and in the development of species.

Natural variations which begin with, or are inherited by, the individual are quite as likely to be in disharmony as in harmony with progressive develop-

ment. The difference being that those which are contrary to the needs of life are not as capable or as prolific, and consequently die out.

It may be well to state that the law of *natural variation* has no reference in biology to perceptible physical changes in structure that arise or that may be produced in individuals from the adaptive forces of environment, or from local causes, or any form of artificial stimuli. All forces which arise from extrinsic causes have little or nothing to do with biology proper, because that kind of variation is not transmissible, except when the cause and its results obtain through many generations so as to finally become a natural variation.

Moreover, physical growth enlargements or "bone growths," which are caused from extrinsic forces, other than those which arise after inhibited developments through a revivification of functional activities, are never of a normal structural character, and certainly never result in healthy interstitial growth of the bones to the extent of carrying their development to a larger than their inherent size or form. This assertion is made advisedly, basing it on the opinions which have recently been obtained from some of the most advanced authors and teachers of biology, and which hardly accord with the somewhat recent propaganda promulgated by certain orthodontic teachers relative to the fantastic possibilities of "bone growth."

NATURAL SELECTION

Darwin's law of *natural selection* is not, as is popularly supposed, the selection of mates through instincts and qualities of the individual, or sexual selection, but it is that which was intelligently stated by Huxley when he invented the term *"survival of the fittest,"*—in other words, Nature's selection of those who are best fitted for thriving and procreating their kind amid the environments into which they are thrown.

When individuals in plant or animal life are forced to exist amid environments in which they are not physically adapted, or are under destructive influences, against which they are not fully protected, they gradually diminish and die out; though adaptive natural variations may arise in certain of the offspring, similar to adaptive artificial variations which are forced to arise in cross-breeding and which tend to restore the species to the possibilities of progression.

ENVIRONMENT

In the struggle of life, the influences of *Environment* are exerted very strongly upon each individual toward the production of adaptive qualities and variations in form, to render them more fitted for sustaining their lives amid the surroundings into which they are forced. Whole libraries have been written upon this phase of biology alone, but in all these volumes adaptive variations induced to arise in the individual after birth are rarely considered as factors in biologic development, because, as stated before, they are not transmissible, and certainly one finds nothing in regard to the possibility of producing adaptive or harmonizing physical growths in the framework of animals after birth by mechanical or any other stimuli, because biologists are engaged with problems of *natural* reproduction and development.

Such variations in the individual are seen at times in plants whose roots and limbs reach out after moisture and sunlight, but rarely if ever in animal life; except perhaps in superficial tissues, with no effect upon the framework or skeleton, except in instances of inhibition, resulting in diminished growth. What does occur and through the forces of which all the various forms of life and species have sprung, is: an offspring appears, among the many, with a *natural* or an inherited variation, perhaps induced in fertility by the stimulation of needs which surround the parents, resulting perhaps in only a slight change in form or structure, and yet sufficient to make life easier and more vigorous, and capable of greater protection, and possibly more attractive to mates, with increased chances of reproduction. Thus from generation to generation other adaptive variations are added—and inherited by the offspring—the higher adaptive qualities crowding out the weaker.

The neck of the giraffe and the necks of its million progenitors, back to the first variation which marked the beginning of this type, did not grow to its present length by increasing the inherited lengths of its seven cervical vertebræ during the lives of each of the successive individuals, even though strongly stimulated by the demands of hunger and repeated efforts to reach higher for its tropical foods. Every marked change in the slow development of these adaptive qualities arose first with some *natural variation* in the offspring, which added a little to the length of the vertebræ of the neck, giving them a better chance; and in the next, or some succeeding generation, another slight adaptive variation arose rendering them still more fitted for the environment, and so on, through myriads of variations to the present form. During these long periods, those who were less fitted were dropped from this progressively developing species by dying out, or by becoming a factor in the development of some other kind of animal, through being forced into a different environment for food, protection, etc.

The science of organic evolution which is now accepted by all competent biologists asserts that variations in plant and animal types, through all the past and present forms of life, have not originated because of the stimulation of use or influences of environment, but they have arisen solely because, first, of the *law* of "natural variation," and second, the law of heredity, through the admixture of dissimilar types. Not the smallest portion of an extra cusp of a human tooth ever started to develop because of use or needs that were not first laid down in the germ cells of that individual through the laws of heredity or natural variation. The influences of use and environment are *subsequent* forces upon already endowed forms and qualities, adapting the fitter types of life to the needs of surroundings, and stimulating them to more vigorous growth and reproductive activities.

What these unseen guiding forces are—or any of the objective qualities of all natural forces—we probably will never know in this life, or anything beyond the subjective cognition of the phenomena produced. No one can intelligently contemplate the probable forces which have been at work during the millions of past years in the origin and development of organic life from its simplest form

up to man, without a profound feeling of awe for the unknowable guiding forces which set in motion and control this orderly sequence of events.

The men who have been devoting their lives to the possibilities of these laws in the biologic field, in patient and painstaking investigation, tell us that these are the only ways in which structural variations in organic life are brought about. This is not to underrate the important part which environment plays in the great work of evolution. Nature selects only those whose endowments permit them to live, and those who possess the more adaptive qualities are to that extent more capable of coordination, development, and propagation. They are, moreover, better fitted through their vigor to aid in the transmission of those adaptive natural variations which they may have been the very first to possess.

It can be seen by this that there are three great laws which have produced and governed organic evolution, i. e., Heredity, Natural Variation, and Natural Selection. Influences of environment upon individuals through immediate adaptability to surrounding conditions are of far less importance, as has been explained; and yet a coordination of environment with natural selection has led to the preservation and continuation of those which are naturally best adapted to thrive, and the weeding out of those which are incapable of adaptation to the environment.

Thus it has been with everything, everywhere throughout the past ages in the developmental processes toward surrounding us with untold variety of living things. When one begins to comprehend the wonderful coordination and interdependence of the forces of heredity, variation, natural selection, and environment, a far far deeper veneration and love arises for the great Prime Mover of all things.

Man steps in and discovers these laws and their action, and then with his artificial selective breeding facilities, he hastens the operation—that is all. He does not alter or add to it one single biologic law that Nature has not employed through aeons of time. While this is wholly true in the science of biologic evolution, the wonderful work which man has accomplished in the last fifty years, and particularly in the past few years, in creative chemical transformation of the organic compounds, which were supposed not long since to arise only from vital living forces, is something which now far outstrips the works of Nature—freely demonstrated in the chemical transformation of the coal tar products and their creative combination with other compounds.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

DENTAL RADIOGRAPHY*

BY S. GILBERT SCOTT, M.R.C.S., L.R.C.P.

I. THE USE OF THE OBLIQUE RAYS IN DENTAL RADIOGRAPHY

THE practical radiologist makes use of various methods of his own which he has found to be of value by experience. These practical "tips," to use the term, are not as a rule included in books on radiology.

One is taught that the central ray should always pass through the part being examined in order to prevent distortion. This is perfectly correct in most cases, but one never hears a good word said for the oblique rays, which may be employed to advantage in overcoming difficulties by those who know how to use them.

I have been making use of the oblique rays for some years past and have found them of great practical value in examining various parts of the body.

The radiographic examination of teeth in general is not always easy; and many radiologists dislike this "fiddling job," as they term it. Knack, experience and a good eye, used in conjunction with the oblique rays, are required to render the examination consistently successful. Many a film is wasted because on development the extreme tip of a root is found to have been missed altogether. If the oblique rays are used correctly, this elusive part of the root will be found to have been thrown well on to the film.

The method can be easily demonstrated by making use of the light given off from the spiral of a Coolidge tube. The tube is placed over the couch and a dried skull utilized. If, for example, we place the lower jaw on its side and displace the tube across its long axis, the shadow of the jaw nearest the tube will move in the reverse direction. In this way it will be noted that the shadows of both halves of the jaw are interposed when in the center of the illuminated field, but clear of each other when the oblique rays from either

*Printed by permission of Archives of Radiology and Electrotherapy, London.

hemisphere are utilized. Fig. 1 explains the method diagrammatically. Thus, in radiographing the lower jaw, it is necessary to center the tube on a spot well below the level of the jaw itself and rather behind its angle. In order to get a correct idea as to the exact position in which the tube should be placed, it is not a bad plan to watch on the screen the displacement of the shadows produced by the movement of the tube and tilting of the part under examination.

The same method is utilized for displacing the shadow of a tooth on to the film placed in the mouth, but owing to the fact that the distance between the tooth and the film is small, the displacement is proportionately less, although at the same time this will be found sufficient to show the whole tooth, where the lower half would probably have been missed.

In actual practice one should visualize what one is aiming at. Thus, in order to throw the shadow of a tooth lying in the upper jaw downwards on to

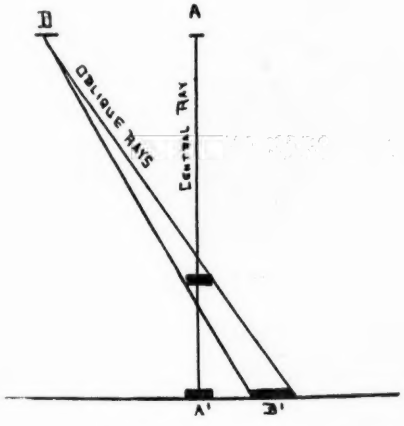

Fig. 1.—Showing displacement of shadow by oblique ray.

Fig. 2.—Lower jaw. Chin. (Quarter plate in mouth.)

the film, the central ray must fall somewhere on the frontal bone, and in the case of the lower teeth it would be quite six inches below the lower jaw. If one works with the tube above, the limit of one's field must be known, otherwise it may be found that in the effort to make full use of the oblique rays, the film has been placed outside the illuminated area. The tilting of the tube is unnecessary and frequently defeats one's object.

The best position for the head can only be found out by experience, and depends on the part of the jaw under examination.

It might be expected that distortion of the image would result from using the oblique rays as described, but this is negligible so long as the film lies more or less in the same plane as the tube.

I have only given a very rough outline of this method, and it must be understood that it is necessary to use one's ingenuity to obtain its full practical value. I think, however, sufficient has been said to indicate how the oblique rays may be made use of, and I must leave it to each one's ingenuity to work out their practical application.

II. THE USES OF A QUARTER PLATE IN DENTAL RADIOGRAPHY

The point of the chin and the floor of the mouth are not easy regions to radiograph satisfactorily. A few words as to the technic used to overcome certain difficulties may, I hope, be found of practical value to the radiologist. In describing the following method I am taking it for granted that the tube is above the patient. The operation may be divided into three stages:

1. Placing of the patient's head.
2. Insertion of a quarter plate into the mouth.
3. Placing of tube.

Fig. 3.—Calculi in Wharton's duct. (Quarter plate in mouth.)

Fig. 4.—Right side. Upper jaw and roof of mouth. (Quarter plate in mouth.)

1. The patient lies on his back and a large sand-bag is placed under the shoulders, so that the head is thrown back as far as possible.

2. The next stage is the placing of a quarter plate with its envelop inside the mouth—at any rate, half of it. To many this may sound impossible, and if one compares the narrowest side of the plate to one's own mouth, this doubt may appear well founded. But the adult mouth is very elastic, and the making a mouthful of a quarter plate is easily accomplished with a little coaxing and lubrication. Needless to say, it is hardly a becoming operation, and if tried on

oneself it is some time before the feeling of the artificially-produced grin wears off. It is unnecessary to cover the plate with waterproof, and in the case of children, where the insertion is necessarily more difficult, but in most cases possible, the outer black envelope may be discarded, the inner red one being carefully fastened down right up to the corners. Those plates sold already done up in double wrappers are the best, as they fit tighter and so lessen the breadth of the mouthful. A little vaseline smeared on the long edges of the plate and in the corners of the mouth will ease things considerably.

The fingers should be used as miniature shoe-horns assisting the first part of the operation and the plate gently pushed home. The amount of plate that disappears into the mouth is rather astonishing. Remember to place the film downwards.

3. Now see that the patient's head is as far back as it will go and tilt the tube so as to bring it into the same plane as the plate, or as nearly so as possible.

It is hardly necessary to say that the sooner the operation is over the better will the patient be pleased.

The method has only been described in detail for examining the lower jaw and floor of the mouth, but it will be readily seen that it can be equally applied to the upper jaw, and if skillfully used by one with a good eye—most of the teeth of one side can be shown altogether on one quarter plate with little or no distortion.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Treatment of an Infection of Dental Origin with Subcutaneous Injections of Electric Colloidal Silver. T. Estéoule. La Odontologia, 1920, xxix, No. 10, p. 435.

The good results obtained in general medicine with standard solutions of colloid metals in the treatment of pneumonia, typhoid fever, sepsis, etc., suggested the idea of utilizing them in infectious conditions following upon inflammatory complications of dental origin (abscess, phlegmon, and so forth). The author reports a case illustrating the advantage to be derived from this therapeutic measure in dental medicine. Electric colloidal silver was employed by him, in small grains, in the course of treatment of a phlegmon of dental origin. The patient, a girl of 19 years, presented a dental abscess due to fourth degree caries of the second right lower molar, with periosteal tenderness. She refused immediate extraction of the tooth, and antiseptic mouth washes were prescribed. Two days later, the swelling increased in size and the edema extended beyond the median line; the tumor appeared hard, nonfluctuating, and the profuse saliva was mixed with pus. These local symptoms were associated with constriction of the jaws and grave general phenomena, fever, severe headache, and insomnia. The patient finally consented to extraction, which proved very difficult, on account of the trismus, and almost bloodless. The maxillary constriction slightly improved, and some yellowish pus exuded from the alveolus. The condition remained stationary for about a week, when it became considerably worse, with intolerable pain and a high temperature, complete trismus and dysphagia. The tumor was very large and hard, the skin red and glistening. The edema extended from the eye to the clavicle, lending considerable size to the neck; the movements of the head were very difficult; it was evidently a case of submaxillary phlegmon. Irrigations of the alveolus with hydrogen peroxide brought large amounts of fetid greenish pus and a small sequestrum. Slight improvement during the next few days was followed by a serious aggravation, with a high fever, well marked dysphagia and a considerable diminution in the amount of pus voided from the empty alveolus. A cutaneous incision of 2 cm. was now applied parallel with the lower maxillary border, from which thick offensive pus escaped in large amounts. The pus gradually became less abundant, the trismus subsided and the patient

could sleep, although the temperature still persisted high. In the presence of these indications of a deep infection (persistent fever, edema, offensive pus, general prostration), a subcutaneous injection of 10 c.c. of electrargol was administered, with very favorable results. On the next day the pus had diminished and a subcutaneous injection of 5 c.c. of electrargol was applied; the same dose was repeated at the end of twenty-four hours and continued for the next week in daily injections. By this time all inflammatory symptoms had disappeared, the patient was able to open the mouth and eat as usual, so that her strength promptly returned under a nourishing diet and tonic measures. The cure in this case was due to the combined effect of the evacuating incision and the electrargol, which by itself alone would have been incapable of arresting the evolution of the inflammatory process. Incision is imperative in the presence of a collection of pus, but nevertheless the action of the electric colloidal silver on the toxic infectious phenomena accompanying the development of the tumor (high persistent fever, continued flow of fetid pus, physical and nervous depression) was very evident. The rapidity with which these symptoms disappeared and the rapid return of strength show the very powerful bactericidal action of the colloid silver, as well as its effect upon the defensive forces of the organism.

Alveolar Infections of Dental Origin as seen by the Roentgenologist. H. W. Dachtler. The American Journal of Roentgenology, 1920, vii, No. 6, p. 302.

The difficulty of both the recognition and the management of dental infections is emphasized by the author, who points out certain mechanical aspects of dental roentgenology due to which all positive results are exceedingly valuable, whereas negative results may be misleading and therefore dangerous. The customary set of ten films to cover the teeth, although sufficient in many cases, is inadequate in many medical cases where a number of dead teeth are present. In order to establish the existence of an abscess, a certain angle is often required, many times not the normal one, to render the abscess clearly visible. In some cases it is necessary to resort to plates on the outside of the jaw to determine definitely whether or not an abscess exists. The configuration of some mouths is such as to preclude the obtaining of absolutely diagnostic films of some of the teeth. In the upper molar region, some abscesses cannot be detected, owing to the angle that the film makes with these teeth and the angle at which the tube must be placed to show the roots at all. Arthritic and nervous patients are not desirable subjects from the viewpoint of diagnostic dental roentgenology.

The interpretation of the films gives rise to other difficulties which can be overcome only on the basis of past experience. Areas of bone atrophy with disappearance of the lime salts at the apex of a tooth always mean infection in some stage. In view of the extreme susceptibility of bone-tissue to infection, it is not to be expected that the dental surgeon can enter the alveolar process without infection in many cases, absolute asepsis being practically impossible. Owing to the nature of alveolar bone, infections in it tend to enter the blood stream early and with certainty, giving rise to secondary manifestations. It is noteworthy that in early cases of very bad secondary infections, perfect films

may show such slight changes that these are easily overlooked. The size of the abscess bears little relation to its danger.

Etiology, Symptoms and Treatment of Alveolar Pyorrhea. Clemm. Zahnaertzliche Rundschau, July 26, 1920, xxix, 29.

Referring to the debate concerning the origin of this affection, whether due to a spirochete or to some unknown complex, the author blames the vague picture of pyorrhea for the conflicting opinions. Holders of certain opinions have been misrepresented in argument. Thus Beyer is said to have seen in the spirochetes which yield locally to salvarsan, a single disease group capable of causing stomatitis, pyorrhea and under certain conditions noma. But Beyer has never made such statements. As far as the author understands him, he merely holds that by mutation from a common strain several pathogenic forms may have been developed. The author's claim that alveolar pyorrhea has ended fatally has been criticized because he did not exclude the possibility of such affections as septic endocarditis due to osteomyelitis, but he regards this as hardly worthy of notice. The severe crises of pain in pyorrhea are not due to periostitis but are common in the very chronic cases of atrophy of the alveoli. Nor are they due to pulpitis which might, of course, be present incidentally. The author's critics are also wrong when they state that extraction of a loosened tooth makes an end to pyorrhea. In two cases cited by the author the symptoms persisted in part after extraction of the affected teeth, but disappeared after blood injections of salvarsan. In the severe crises of pain just mentioned intravenous salvarsan has produced not only relief but permanent disappearance. The author would not perhaps go as far as the French in making a spirillum the sole cause of alveolar phthisis. Time only can solve this riddle of mouth spirochetosis and pyorrhea. In the meantime the author will not attempt to cure the latter by pulling loose teeth.

Etiology, Symptoms and Treatment of Alveolar Pyorrhea. Beyer. Zahnaerztliche Rundschau, August 3, 1920, xxix, 31.

In a recent number of this journal Clemm has answered sufficiently certain criticisms directed against his (Beyer's) views of the nature of pyorrhea. He would add only a few remarks. He believes that an insidious stomatitis may sometimes cause pyorrhea. He has clinical data and microphotographs to show that the symbiotic microorganisms of Vincent's disease can bring this about. That gingivitis and stomatitis may precede pyorrhea has been contended since 1909 by most dentists. During that year Senn announced that when the fusiform bacillus dominated the symbiosis the likelihood of pyorrhea was greater—he was referring only to ulcerative cases. The author after studying thousands of slides has found the typical spirochete to be the dominant germ. When this is absent we find only some form of false pyorrhea. One of the author's critics charges that the characteristic of pyorrhea is its latent progress, which statement is challenged—alveolar pyorrhea is always manifest. The symptoms are largely subjective or referred elsewhere than the gums, but persistent bacteriologic studies will discover a certain number of typical spirochetes. All at once an acute crisis is lighted up and now the

germ in question is found in abundance. Sebba, the leading critic of the author, is, of course, forced to deny this claim outright; but the author, who has convinced others, believes that he can convince any one who will follow his technic.

Etiology, Symptoms and Treatment of Alveolar Pyorrhea. Sebba. Zahnaerztliche Rundschau, August 3, 1920, xxix, 31.

The author has been for some time opposed in debate to Clemm and Beyer on these subjects. Among the bones of controversy is Clemm's alleged death from pyorrhea which Clemm still affirms. In the published record of the case (1915) there is no personal history and the case is specified as one of "parulis" or suppuration of the jaw. The case history contains nothing to suggest alveolar pyorrhea. The source of the so-called parulis is not given. It is not disputed that pyorrhea may not have led to periodontitis, osteomyelitis and septicopyemia. Certainly there is no attempt to exclude this sequence. But in summing up the author calls the case one of necrotizing alveolar pyorrhea with following septicopyemia. Sebba contends that alveolar pyorrhea does not cause necrosis, hence the case was never one of that affection. He also denies that Clemm's cases of intolerable painful crises were due to pyorrhea alone for periodontitis must have been present. As for the assertion ascribed to him that extraction of the loose teeth alone will cure pyorrhea, he never made so foolish a claim. Having an opportunity to read the mss. of Beyer's most recent article (which appears in the same number) he states that the brilliant results attributable to salvarsan have not been experienced by others; and as for stomatitis slowly bringing about pyorrhea he sees here only an ordinary sequence of disease without causal connection; one might likewise say that prolonged gastritis is the habitual cause of cancer of the stomach.

Undernourishment and Its Effects on the Teeth. Endress. Zahntechnische Reform, August 8, 1920, xxiv, 32.

The paper refers to the undernourishment incidental to the recent war and the effects on the teeth are nothing less than catastrophic. Caries has become pandemic, affecting all strata of society. Lime is the most important single dietary article to consider in this connection. First, there was lack of good fertilizer and then lowered lime content in the vegetables on which the subjects were forced to exist. The calcium of the milk was lost to the diet. It was difficult to hold the temporary teeth until the permanent ones could develop. Caries usually began at the neck of the tooth which aggravated the situation, the tooth soon breaking off. The relation of this rapid caries to acid mouth was difficult to ascertain and act upon. Attempts to correct mouth acidity have disadvantages. The author would attach much more importance to increasing the lime content of the blood. In soldiers the author and others have found marked atrophy of the gums, with increased sensibility of the tooth neck and loosening of the teeth. These changes could not be attributable to calculus deposit but purely to undernourishment. The author has found massage of the gums of value.

Post-influenzal Necrosis of the Palatine Roof. Ritter. Zahnärztliche Rundschau, 1920, No. 27.

The patient was an anæmic man 35 years of age, who came under treatment for a severe inflammatory process affecting all the teeth in the upper jaw. The front and canine teeth were quite loose; a well-marked rather circumscribed swelling (parulis) was present above the alveolar margin of the middle incisors, and on pressure large amounts of pus were voided. Back of the incisors was an advanced necrotic process of the hard palate, with round whitish ulcerative and disintegrating nodules. This process extended uniformly on both sides of the middle line as far as about the third portion of the hard palate, and appeared different from ordinary ulcerative stomatitis. This condition, associated with chills and fever, was said to have existed no longer than eight days, and had followed after an attack of influenza. Treatment consisted in removal of the two loose middle incisors, with scraping of the necrotic masses; the instrument reached friable tissue about three cm. in the longitudinal direction of the palatine roof. The entire buccal surface was painted with pure tincture of iodine; alternate irrigations with hydrogen peroxide and aluminium acetate. In spite of treatment, there was no improvement, and the patient steadily lost ground. Before the microscopical examination could elucidate the clinical pictures, he succumbed to general sepsis, under sudden onset of high temperature and extension of the necrotic process to the entire palate.

Cellulitis of and Abscess in the Para-pharyngeal Tissues Causing Laryngeal Edema. C. G. Coakley. The Laryngoscope, 1920, xxx, No. 2, p. 65.

Attention is called to a class of cases known as Ludwig's angina, in which there exists a definite pus collection in the region of the submaxillary gland, sometimes in the sublingual glands, and at other times beneath the tongue anteriorly. These cases are accompanied by laryngeal edema, and differ from a type of the disease which runs its course without any discoverable localized abscess formation, but is also associated with laryngeal edema, by the presence of an upward, or upward and backward displacement of the tongue. The author believes that most of these infections come from mouth organisms passing through the mucous membrane of the floor of the mouth or side wall of the pharynx, but some of them come from carious teeth. Several cases of this suppurative type are seen each year in his service at Bellevue Hospital, and all recovered after free external incision into the abscess. In two cases there was such evident fluctuation in the floor of the mouth between the tongue and ramus of the jaw that an incision was made in this region for the evacuation of the pus. While this sufficed in adult patients, the process kept up so long in the case of an infant about one year old, that it was necessary to make a counter-opening beneath the inferior maxilla for adequate drainage.

Four Cases of Maxillary Periostitis with a Fatal Outcome. G. Grandi. La Stomatologia, 1920, June 30th.

Four deaths following periostitis of the jaws occurred in the course of the last two months in the Triest City Hospital, a remarkably high mortality in a

a relatively short space of time. In one of these cases, which came to autopsy, it was possible to trace the etiology of the disease and the destructive advance of the bacilli. The patient, a man forty-one years of age, was admitted to the hospital after having suffered for a fortnight from severe mandibular pains on the right side, followed by a swelling of the neck, tender on pressure. Fluctuation could be felt under the chin. The skin was tense and reddened. Treatment consisted in deep incision under the right mandible down to the bone which was found to be denuded of its periosteum. Intravenous injection of collargol. In the course of the next five days the phlegmonous inflammation extended to the temporal region; a deep incision was applied, and the temporal bone was found to be denuded of its periosteum. On the following day, the patient died. The autopsy showed a phlegmonous infiltration of the cervical glands. On cross section, the denuded right maxillary bone was found to be impregnated with blackish pus in its spongy substance. Pus was found in the mandibular canal, passing through the posterior foramen and destroying the articular capsule, then ascending along the temporal bone and infiltrating the brain, where it gave rise to acute purulent pachymeningitis. The septic products of the mouth had penetrated between a molar tooth and the alveolus, causing acute infection of the periosteum which became propagated along the third branch of the trigeminal nerve and reached the meninges. In view of the spongy substance of the right portion of the maxilla being entirely infiltrated with pus, the conclusion is justified that the periostitis of the tooth gave rise to the alveolar periostitis and later on determined osteomyelitic suppuration, the pus taking the above outlined path. The bacilli were evidently extremely virulent; the microscopical examination showed staphylococci and streptococci. In view of the gravity and frequency of these cases of periostitis and osteomyelitis, certain rules should govern the dentist's conduct. In the first place, all injections of novocain, stovain, or derivatives of cocain into swollen tissues should be absolutely prohibited. The author never employs these agents and accords the preference to ethyl chloride anesthesia for dental extraction. When extraction does not provide sufficient escape of the pus, a wide opening should be applied, not merely an incision of the mucosa and the periosteum. The maxillary bone should be trephined and drained, and in all cases, all the purulent foci should be exposed; this alone will prevent the pus from taking a path which may lead to death. The above observation teaches the gravity of these infections, especially as regards their possible results. Patients should be instructed as to the urgent necessity for surgical intervention; delay under these conditions may induce serious disturbances and sometimes death.

Dental Cysts and Maxillary Tumors. Polus. Le Journal Dentaire Belge, 1920, No. 4, p. 189.

Four cysts of the upper jaw were operated upon by the author through the alveolar crest, no suture being required. A complete and rapid cure was obtained in all cases. The vestibular route is usually recommended for surgical intervention, and is undoubtedly the procedure of choice for small radicular cysts, with resection of the root and preservation of the tooth. For large

cysts, however, better results are probably obtainable by means of the route through the alveolar crest. The free access provided by this operation permits the control of the cavity after extirpation of the cyst, which is not possible in the procedure by the vestibular route. Another advantage consists in the easy detachment of the cyst without damage and destruction of the walls. The cyst can be reliably extirpated as a whole. The postoperative treatment is easy; drainage takes place automatically and naturally, the wound being in the most dependent portion, which is not the case when the vestibular route is employed. This operative technic requires neither the detachment of a flap of mucosa with the periosteum nor the application of a suture, two very delicate and difficult procedures. A disadvantage consists in the necessary sacrifice of one or several teeth. The operation begins with the extraction of the tooth which causes the cyst and of the adjacent teeth when necessary to provide free access. This is followed by extensive detachment of the vestibular and palatine mucosa, and instrumental abrasion of the alveolar crests. Dissection of the cyst-wall, extirpation of the cyst without damaging its wall, destruction of all membranes in case of rupture of the cyst; examination of the cavity with the electric buccal incisor, to ascertain the completeness of the extirpation. The four essential conclusions arrived at by the author are as follows: (1) Absolute necessity of radiography in all doubtful cases; (2) Intervention by way of the alveolar crest; (3) Packing with iodoform gauze, maximum duration of twenty-four hours; (4) Absolute insufficiency of simple curettage in the treatment of dental cysts.

In the case of a patient 72 years of age, the diagnosis of inoperable sarcoma at the angle of the left mandible had been rendered. On the basis of radiographic findings, the presence of an atypical wisdom tooth which had followed an abnormal course was suspected. Operation was performed and the finger was introduced between the maxillary bone and the upper portion of the submaxillary gland; an incision was applied, and liberated instead of a wisdom tooth, a salivary calculus.

Modern Prosthetic Treatment of Jaw Injuries. De Vecchis. La Riforma Medica, 1920, No. 5.

The author gives a brief survey of the treatment of jaw injuries during the war. The main feature consists in absolute fixation, for the avoidance of pain, asymmetrical position, bony crepitation, danger of infection, contraction of scar tissue, pseudarthrosis, and aspiration pneumonia. In recent injuries, irrigations with physiologic salt solution, potassium permanganate solution 1.3000, or hydrogen peroxide, are recommended, for the mechanical removal of septic material. Penetrating gunshot wounds are more common than impacted projectiles. Cooperation of surgeon and dentist is necessary. After the wound has become clean, at the end of six to twelve days, an apparatus is adjusted. No bone-suture is applied on account of the danger of infection. In fractures with a loss of substance, the proper position of the teeth and the bite must be carefully controlled, followed by fixation with a wire bolt which is fastened to the last molars. The width of this wire bolt can be adjusted with screws. In mandibular fractures, the bolt is applied to the upper jaw, gradu-

ally and steadily approximating the fragments by means of elastic traction. There is an appliance consisting of a series of metal caps which are adjusted to the anatomical configuration of the individual teeth and attached to them. These caps bear tubes and screws to which pulleys are attached. A loss of substance is covered by wire bands between the two tiers of molars or in the course of the row of teeth. The fragments are often replaced in one day through elastic traction; the pulley is then replaced by wires, so that the lower jaw is fixed to the upper jaw. The apparatus is left in place for from forty to fifty days, during which time only liquid food is taken. When only a few isolated teeth are present, a strong wire bolt is cemented to the crown, and the elastic traction is then exerted from the points.

Stomatology in Portugal. H. Allaeys. Revue Belge de Stomatologie, 1920, xviii, No. 5, p. 251.

The Portuguese Stomatologic Society, planned soon after the foundation of the International Stomatologic Association in 1907, but delayed in its establishment by long years of political disturbances, was definitely created in July of 1919. Portugal, which has nearly six million inhabitants, at present has sixty-eight medical stomatologists, of whom fifty are already registered as members of the new society; these physicians are scattered in part through the various departments of the country, but the majority are naturally residents of Lisbon, the capital, where the pioneer workers in Portuguese stomatology are established. Since 1911, the practice of dentistry and stomatology in Portugal is exclusively restricted to doctors of medicine, and therefore to stomatologists; the new law having no retroactive effect as regards dentists who are not doctors, but have been graduated and in practice prior to that date. While this excellent ruling was of course primarily due to the intrepid procedure of native stomatologists, the International Stomatologic Association has been more or less directly concerned in it since 1907, and as a matter of fact, doctors of medicine alone had access to the section on stomatology at the International Medical Congress held in Lisbon in 1906. The necessary corollary of the Portugese law of 1911, which restricts stomatology to doctors of medicine, namely the creation of professorships and establishment of courses of instruction in stomatology in Portuguese universities, may be accomplished next year, in 1921, when the first applications for chairs and titles for professors of stomatology will be received. The immediate and inevitable result will be a very appreciable increase in the number of specialists in stomatology, who will not only replace the nonmedical dentists in the normal course of events, but will actually increase both in quantity and quality the number of practitioners of the bucco-dental specialty, to the great advantage of public health in Portugal. Meanwhile, stomatologic services are already fairly generally established in the hospitals, all under expert medical direction and with a medical staff, giving to the young specialist an opportunity for instruction and clinical observation. There is an excellent stomatological service in Lisbon, in St. Martha's Hospital of the Faculty of Medicine, as well as in San Jose's Hospital, and stomatological clinics functionate likewise in the military and naval hospitals all under the care of medical stomatologists.

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EDITORIALS

A Movement to Lower the Standards of the Dental Profession by Admitting Laboratory Men

DURING the past few years various laws and regulations have been enacted by different bodies for the purpose of raising the standing of the dental profession, and it is with regret that we have seen attempts made to render the work of those many years null and void. One attempt is a movement to gain a professional recognition for mechanical men. Just what has been the cause of this, we are unable to say, but it seems to have gained considerable headway and is appearing through channels that would be least suspected.

One of the first attempts to gain recognition for the mechanical laboratory men that would give them a professional standing was noted when a movement was started in a large dental society to admit mechanical men to mem-

bership. When the objection was raised, some of the dentists claimed that any one that would not vote to change the constitution of the society so as to admit dental laboratory men was narrow and selfish. This cry of being narrow and selfish is one that has been raised by some one every time a criticism of any pet scheme has been made. In fact, if the denial of membership to laboratory men in a dental society is narrow and selfish, then we must admit that every dental law that has been enacted for the regulation of the profession has been narrow and selfish, for the very purpose of the dental law has been to keep the unqualified out of the profession. The dental laboratory men are not qualified to become members of the dental societies because they cannot meet the professional requirements of the society or of the dental laws.

The first requirement for membership in a dental society, and also of the one in question, is that a man must have passed a state board of dental examiners. This the dental laboratory man, as a rule, has not done; and if he has, we have no objection to his becoming a member. All members of dental societies have not only been compelled to satisfy the state boards of dental examiners, but they have been compelled to have certain preliminary education before they even were allowed to enter college. These preliminary requirements were enacted for the good of the profession and we are sure it will be doing the profession no good if, by one amendment to the constitution of a dental society, the laboratory men will be given the same privileges of membership that the dentist has acquired by years of work.

We should like to ask of those in the profession who are working to get laboratory men into the societies, whether they are willing to have the dental laws set aside and changed so that any one may take the examination to practice dentistry regardless of education and training? If they are willing to do that, then the laboratory men will have a chance to become dentists and naturally be allowed membership in the state and local dental societies.

Another argument advanced is that we should educate laboratory men and women in our profession to the utmost of our ability, thereby fitting them to do better work. Unfortunately at the present time many states allow men who have not passed the dental boards, to do mechanical dentistry. We hope the time will come when no one may do any part of a dental operation unless he has taken a full dental course. However, so long as dental laboratory men are allowed, there is nothing to prevent any one from training a laboratory man to do certain things. After this man has been trained, we see why the dentist for whom he is working, may try to have him made a member of a dental society. By becoming a member he can be further educated by the membership of the society. This dentist is willing to sell the standing of his profession for the few dollars the laboratory man may be able to earn for him as a result of the membership in the dental society being so lowered to admit an unqualified man.

It has been suggested by some that laboratory men can give valuable aid and assistance to some of the members of the profession. Granting that this is true, which we doubt, we respectfully call attention to the fact that the plumber, the electrician, and many others can also give pointers, but they

are not qualified to practice dentistry, and therefore should not be admitted to membership in a dental society. In citing those who might be admitted to dental societies because they are intimately associated with the practice of dentistry, we might also include the doorman, the elevator boy, and the scrub woman, but we contend that they, like the laboratory man, have not fulfilled the requirements to pass the dental boards, and are therefore forced to go through life without the advantage of membership in a dental society. To claim that the laboratory man is a part of the profession is making a claim that, if proved, would also include the office assistant, the bookkeeper, and a host of others who are as vital to the practice of dentistry as the laboratory man.

We have been accused of being narrow and selfish because we do not believe in admitting to membership in the dental societies any one who does not meet the requirement necessary to practice dentistry. However, speaking of being narrow and selfish, we believe the motive back of the movement to educate and advance the laboratory man is primarily one of selfishness. Some dentists have partially trained laboratory men to do certain work and these members are so selfish that they believe that if the laboratory man can be made a member of a dental society he will learn something that will be a profit to them. Those who are working the hardest to give laboratory men special privileges are not doing it with a view to improving the laboratory men only, but with a view to making the laboratory men more valuable to the individual dentist.

The question of educating the dental laboratory assistants was taken up in a paper read before the National Dental Association in Boston and published in the *Journal of the National Dental Association.* All of the arguments made in that paper can be interpreted to mean that some of the profession want trained laboratory assistants so they can pay the assistant $50.00 a week and collect four times that amount from the patient. All of the arguments advocated for the education of the laboratory men show that the dentist wants some one to help him make more money so that he can play more golf.

The methods advocated for educating laboratory assistants show that most men who advocate such a thing have little knowledge of the present conditions in dental education. The suggestion that dental colleges educate laboratory assistants is impossible, because dental colleges are charted to educate dentists and the student must have certain educational requirements to enter the college. If the laboratory man had those requirements, he would study dentistry. If the plan suggested to educate laboratory men were carried out, it would give us a new creation that would be difficult to name.

We have no objection to the laboratory man being educated, but he must have the same education as is recognized by the state board if he is to be admitted to membership in dental societies. Until such educational requirements are met, the attempts to admit laboratory men into societies and to educate them in dental colleges will only be movements that will bring the standing of the dental profession to a level with the laboratory men, for, because of the lack of preliminary education and professional training, it is impossible to bring the laboratory men to the level of the profession.

Announcements for the Journal

THE International Journal of Orthodontia, being anxious to serve its subscribers in the best possible manner, welcomes for publication all items and news notes of interest to orthodontists, dentists interested in orthodontists, oral surgeons, and radiodontists.

Information as to dates and places of meeting of societies of interest to the above specialties, organization of societies, names of officers, etc., is requested.

The Journal is also glad to publish formal announcement cards of those who are interested in the subjects to which it devotes its pages. Requests are constantly being received for names and addresses of orthodontists in the various large cities of the world, consequently we solicit such information for our files.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Meeting of the American Society of Orthodontists

The Twentieth Annual Meeting of the American Society of Orthodontists will be held at the Ambassador Hotel, Atlantic City, N. J., Wednesday, Thursday, Friday and Saturday, April 27, 28, 29 and 30, 1921.

The Board of Censors have arranged the following program:

Wednesday, April 27, 9 *a. m.*

Meeting of the Board of Censors.
President's Address.
J. Lowe Young, New York City.
Report of the Board of Censors on new members and the election of officers.

Wednesday, 2 *p. m.*

The Pathology and Diagnosis of Disto-clusion.
B. E. Lischer, St. Louis, Mo.
The Temporo-mandibular Articulation in the Disto-clusion Case.
A. LeRoy Johnson, Boston, Mass.
The Influence of the Forces of Occlusion on the Development of the Bones of the Skull.
Lawrence W. Baker, Boston, Mass.

Thursday, April 28, 9 *a. m.*

Studies on the Etiology of Angle's Class II Malocclusal Manifestations.
Milo Hellman, New York City.
The Effect of the War Diet on the Teeth and Jaws of the Children of Vienna, Austria.
Sheldon Friel, Dublin, Ireland.

Thursday, 2 *p. m.*

Report of Cases Other than Disto-clusion.
I. Finished Neutro-clusion Case.
II. Finished Mesio-clusion Case.
Allen Holman Suggett, San Francisco, Cal.
Report of Case Showing Physical and Mental Development.
Burt Abell, Toledo, Ohio.
Report of Two Cases.
Robert Dunn, San Francisco, Cal.
Report of Case Showing the Loss of Half of the Mandible by Operation for Sarcoma at the Age of Seven Years. Restoration by Bone Grafting Twenty Years Later.
Robert H. Ivy, Philadelphia, Pa.

Report of Three Cases.
Harry E. Kelsey, Baltimore, Md.
Report of Cases Showing "Stimulating Arch Development by the Exercise of the Masseter-temporal Group of Muscles."
Alfred P. Rogers, Boston, Mass.
Report of Case Showing "Closing of Spaces in Mutilated Cases."
John V. Mershon, Philadelphia, Pa.
Report of Cases Shown by Moving Picture Film.
Adelbert Fernald, Boston, Mass.

Thursday, 6:30 *p. m.*

Annual Dinner (Informal)

Friday, April 29, 9 *a. m.*

The Treatment of Disto-clusion.
Herbert A. Pullen, Buffalo, N. Y.
Report of Disto-clusion Cases.
I. Report of Case, Class II, Div. I (Angle) with Deep Overbite.
II. Report of Case, Class II, Div. I (Angle) with Normal Overbite.
Herbert A. Pullen, Buffalo, N. Y.
Report of Case, Models of Class II (Angle) before Treatment and Models of Same Case Twenty Years after Treatment.
Horace L. Howe, Boston, Mass.
I. Report of Case Treated with Angle Pin and Tube Appliance.
II. Report of Class II, Div. I (Angle) (Unsuccessful). No Root Movement of Upper Incisors and Cuspids.
J. A. Burrill, Chicago, Ill.

Friday, 2 *p. m.*

Post-operative Treatment of Class II. (Disto-clusion).
C. A. Hawley, Washington, D. C.
Prognosis of Disto-clusion Cases.
Hugh K. Hatfield, Boston, Mass.

Saturday, April 30, 9 *a. m.*

Clinics I.
I. Lingual Arch Technic.
H. A. Pullen, Buffalo, N. Y.
II. Lingual Wire Appliance to Move Impacted Cuspids.
Allen Holman Suggett, San Francisco, Cal.
III. Record Models Simplified Technic.
Oliver Wilson White, Detroit, Mich.
IV. A Stable Lingual Lock for Use with Removable Lingual Arches.
Lourie J. Porter, New York City.
V. An Efficient Lingual Lock and Springs.
Ernst N. Bach, Toledo, Ohio.

Clinics II.
I. Locking Device for Lingual Arch.
Incline Planes for Retention of Class II Cases.
Horace L. Howe, Boston, Mass.
II. Plaster Impression Models and Facial Casts.
O. A. Oliver, Nashville, Tenn.
III. Direct Method of Band Technic.
Harry T. Deane, New York City.
IV. Improved Record Model.
S. L. Kregarman, New York City.
V. Howard Model Machine and Measuring Instruments. (Designed for Orthodontists)
Joseph D. Eby, New York City.

Clinics III.
I. Complete Clinic on Orthodontic Engineering.
Lionel Hartley, New York City.
II. Lingual Arches and New Orthodontic Pliers.
Adelbert Fernald, Boston, Mass.
III. Jackson Appliances.
Victor Hugo Jackson, New York City.

Saturday, 2 *p. m.*

Business Session.

Alumni Society of the Dewey School of Orthodontia

The eleventh annual meeting of the Alumni Society of the Dewey School of Orthodontia will be held on April 25th and 26th at the Hotel Ambassador in Atlantic City.

The following program has been arranged:

Monday, April 25th, 1921

President's Address.
Sydney W. Bradley, Ottawa, Ont., Canada.
Early Manifestations of Irregularities as Seen in the Deciduous Arch. Treatment and Report of Cases.
Edward A. Bogue, New York City.
What a General Practitioner Should Know about Orthodontia to Best Serve His Patients.
C. Angus Kennedy, Toronto, Canada.
Changes in Nasal and Oral Cavities as a Result of Orthodontic Treatment.
Martin Dewey, New York City.
Spring Action, Position or Otherwise.
A. C. Gifford, Oshkosh, Wis.

Tuesday, April 26th, 1921

Infra and Supra Occlusion with Lantern Slides.
C. C. Howard, Atlanta, Ga.

The Use and Construction of a Stable Lingual Lock on Removable Lingual Arches.
Lowrie J. Porter, New York City.

The Logic of Heavier Springs in the Physiology of Tooth Movement.
Joseph D. Eby, New York City.

Report on President's Address and Annual Election of Officers.

A Consideration of Bite Planes in Orthodontia.
Victor Hugo Jackson, New York City.

A Study of Facial Expression as Influenced by the Position of the Teeth, Illustrated by Moving Pictures.
Adelbert Fernald, Boston, Mass.

An Original Instrument for Making Bands.
P. L. Salzberg, Brooklyn, N. Y.

Clinics, 8 *p. m.*

Locking Device for Removable Appliances.
Jas. J. Ford, Jr., Chicago, Ill.

An Efficient Lingual Lock Spring.
Ernest Bach, Toledo, Ohio.

Treatment of Excessive Overbite and Apical Movement of Incisors with the Lingual Arches.
J. Frank Nelson, Chicago, Ill.

A Stable Lingual Lock for Use with Removable Lingual Arches.
Lowrie J. Porter, New York City.

A Fixed Removable Appliance on the Jackson Principle.
Joseph E. Johnson, Louisville, Ky.

Spring Action, Position or Otherwise.
A. C. Gifford, Oshkosh, Wis.

An Improved Record Model.
S. L. Kregarman, New York City

Some Features of the Lingual Appliance.
C. S. Hurlburt, Springfield, Mass.

Appliances for Opening Bite with Retainer for Same.
E. R. Schroder, Alameda, Calif.

Some Right Angle Instruments for Cleaning and Polishing the Teeth and Appliances.
Adelbert Fernald, Boston, Mass.

An Instrument for Appliance Adjustment.
N. C. Leonard, Baltimore, Md.

Original Instrument for Measuring and Trimming Orthodontic Plaster Casts.
C. C. Howard, Atlanta, Ga.

The Southwestern Society of Orthodontists

The Southwestern Society of Orthodontists was organized in Dallas, Texas, March 7, 1921, and the following six days enjoyed a postgraduate course under the direction of Dr. A. H. Ketcham of Denver, Colo., on the subject of the Lingual Appliance, also the Ribbon Arch and Bracket. The organization of this Society fills a long felt want among the Orthodontists of the Southwest. Some twenty-five Orthodontists are located in the States covered by this Organization, and the future looks very bright, indeed, for a prosperous Society. The next annual meeting will be held in Oklahoma City, Okla. The Officers elected for 1921 are as follows: Dr. T. O. Gorman, San Antonio, Texas, President. Dr. W. E. Flesher, Oklahoma City, Okla., President-Elect. Dr. P. G. Spencer, Waco, Texas, Sec.-Treas. Drs. T. W. Sorrels, O. E. Busby, and T. G. Duckworth, compose the Board of Censors.

Meeting of the Board of Dental Examiners of Alabama

The Board of Dental Examiners of Alabama, will meet Monday, June 20, 1921, at 9 o'clock A. M., at the Birmingham Dental College, Avenue F and 20th Street, Birmingham, Alabama, for the purpose of examining applicants who hold diplomas from reputable dental colleges, for certificate of qualification to practice dentistry in Alabama.

All applications accompanied by the examination fee must be filed with the Secretary-Treasurer at least one week before the examination. For further information, application blanks, etc., address, H. Clay Hassell, Secretary-Treasurer, 616-22nd Ave., Tuscaloosa, Ala.

Missouri State Dental Association

The fifty-sixth annual meeting of the Missouri State Dental Association, will be held at Springfield, Missouri, April 25, 26, and 27. The meeting will take the form of an intensive postgraduate course, five distinct and separate courses being given, by prominent men, on the various subjects.

National Dental Association Meeting, August 15 to 19, 1921

Milwaukee, metropolis of Wisconsin, famed from coast to coast for its homes, health, and hospitality, as well as for the fact that it is the greatest convention city in the middle west, will act as a great reception committee and hostess to the 8000 or more delegates, visitors and guests, attending the twenty-fifth or Silver Anniversary Convention of the National Dental Association on August 15 to 19, 1921.

Milwaukee's auditorium, an ornate structure right in the heart of the city, erected at a cost of $1,500,000 will be the scene of the great gathering of representatives of the dental profession and its allied activities.

Managements of the various hotels have already reported reservations for the convention in August, which is indicative of the fact that the entire country from coast to coast, and North to South, will have representation at the great Silver Anniversary gathering of one of the leading professions.

Milwaukee committees and officers of the National Dental Association are co-operating to make the Silver Anniversary Convention a success.

Announcement of New Plaster Plane and Measuring Instruments

Dr. Clinton C. Howard of Atlanta, Georgia, has been successful in securing the completion of his first fifty motor driven model planes, together with specially designed measuring instruments. Dr. Howard has spent a number of years in perfecting the above instruments to meet the exact requirements of the orthodontist. His efforts will be welcomed by the profession.

Items of Interest

Dr. Harle L. Parks announces the removal of his office from Harriman, Tennessee, to Atlanta, Georgia. Associated with Dr. Thos. P. Hinman, 507-15 Fourth National Bank Building. Practice limited to orthodontia.

Dr. P. R. Ashplant announces the opening of his office at 170 Grand Street, Newburgh, N. Y., for the practice of orthodontia exclusively.

Dr. Guy B. Fairchild announces his return from New York City, and the re-opening of his office, Suite 319, Northwestern National Bank Building, Grand Forks, North Dakota. Dr. Fairchild will limit his practice to orthodontia.